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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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A Petroleum By-Products Industry

ALTHOUGH coal gas was discovered in the late eighteenth century, and its application was becoming general in the early years of the nineteenth, it was not until nearly half a century later that Hofmann laid the foundation of coal tar chemistry as it is understood to-day. Until then, coal tar was used merely as a fuel. The parallel in the case of petroleum is almost exact. It is over sixty years since the possibilities of petroleum were recognised by Silliman, and the first well drilled at Titusville. Petroleum is used to-day merely as a combustible—as fuel for internal combustion and Diesel engines, as illuminating oil and as direct fuel. The desire for its more scientific utilisation which has been developing in the minds of petroleum chemists was crystallised by Sir William Pope in his address to the members of the Society of Chemical Industry at the annual meeting in Montreal. The development of a petroleum products industry was held to be the rational and progressive move.

There is no mistaking what this means. Our knowledge of petroleum is relatively scanty, and any progress in the utilisation of petroleum hydrocarbons in synthetic chemistry must be preceded by an intense and exhaustive study of hydrocarbon chemistry. The constituents of the many varieties of natural petroleum will need to be studied in wearisome detail, and methods for the isolation, identification and characterisation of the hundreds of hydrocarbons present in natural oil worked out. To anyone who has attempted an exhaustive and ultimate fractionation of a natural petroleum, the elaborate experiments of a Mabery appeal with special force, and the magnitude of the problem of isolating particular hydrocarbons must be fully realised. The power, however, to obtain definite hydrocarbons is an essential condition to the establishing of an industry approximating in complexity and scope to the coal tar industry.

On the other hand, it is unfair to the petroleum chemist and technologist to press the analogy too far. In the period 1800 to 1850 practically nothing was done in coal tar chemistry and development. In the petroleum industry, on the contrary, improvements in refining technique and in petroleum utilisation have occurred, particularly in the last decade. Elimination of refining losses and the separation of oil-water emulsions—which formerly led to enormous waste—have been effected. Many sulphur-containing oils are capable of use now, and refining methods in general have led to the production of high quality "cuts." "Cracking" processes—particularly the Burton process—are now producing four hundred million gallons of petrol annually in America. Aromatic hydrocarbons can be made from petroleum (aliphatic) hydrocarbons. Fatty acids have been made from paraffin, although here, again, the necessity for a full and complete knowledge of the constituents of natural petroleum is demonstrated, and such knowledge must precede any wide application of the oxidation method to hydrocarbons occurring in the many natural mineral oils. Dyestuffs have been manufactured by nitrating high boiling fractions of mineral oil—machine oils—as well as from naphthenic acids. Unsaturated gases coming from "cracking" operations are used for the production of iso-propyl alcohol and esters; and natural gas, after deprivation of its valuable petrol, is serving as potential raw material for the preparation of chlor methanes—methyl chloride, chloroform, etc.—and of methyl alcohol. The attack on the hydrocarbon molecule by means of chlorine has been developed to a considerable extent. By chlorination of lower fractions of petroleum, and subsequent elimination of HCl, and suitable treatment, isoprene has been obtained and higher oils have furnished a linseed oil substitute.

The record of isolated achievements could be elaborated and extended, but they will remain isolated and

disconnected until hydrocarbon chemistry itself presents a more complete picture. Finally, the science of lubrication can proceed but haltingly until definite hydrocarbons are isolated and their influence upon the viscosity and "oiliness" of mixtures determined. Still, here again pioneers are at work. Mabery and Matthews, for instance, have found that hydrocarbons of the series 2_{n-2} have less viscosity at equal boiling points than those of series 2_{n-4}. This must serve as a single example of research upon the definition of specific effects of specific hydrocarbons. The illimitable possibilities of a hydrocarbon product industry—and its economic justification, when oil supplies are only a tithe of coal supplies, present and prospective—demand the development of hydrocarbon chemistry in the most exhaustive degree.

The Importance of Vitamines

THE question of vitamines as a factor in nutrition appears to be assuming a new importance in view of the large number of so-called artificial foods which are now consumed in considerable quantity, more especially by the working classes. No doubt the world shortage of natural foodstuffs during the war was mainly responsible for an increased consumption of manufactured substitutes, and there are few who have not had a fairly general experience of "ersatz" products in some form or other. A decade ago many of those who now devour substances made palatable and not unwholesome by the ingenuity of the chemist would have shuddered at the thought; but stern necessity has altered the opinion of the most fastidious, and, though the taste in some cases may have to be acquired, the habit is also acquired, with the result that the substitute is now accepted almost without demur. The average individual, of course, so long as he gains a feeling of repleteness from his meals, does not stop to question the dietary value of what he has consumed. He is not in a position to differentiate between the nutritive value of natural and artificial foodstuffs, and certainly does not appreciate that his normal menu may, from the physiological point of view, be dangerously deficient in essential vitamine factors. Even to the average chemist, the study of vitamines proves a little entangled, mainly owing to the fact that it is not at the present time possible to state with certainty the chemical composition of these bodies, whose name was originally given them by Funk. It is definitely ascertained, however, that they are essential to growth and proper nutrition, and time-honoured theories have, accordingly, been considerably modified by this comparatively new branch of scientific investigation. The result is that to-day we are far more prone to the so-called "deficiency" diseases.

Only last month we published a comprehensive article which dealt with the vitamine content of foods produced from hydrogenated oils, and at the recent meeting of the British Association Dr. J. C. Drummond drew attention to the fact that the dietary of the masses of the people in large towns consists of white bread, cheap margarine, potatoes, a little meat and condensed milk. The whole tendency of modern feeding is, in fact, in the direction of the artificial, a practice which is fundamentally wrong. It has been contended that the normal diet is so varied that the deficiency of vitamines in one foodstuff is counteracted by those in another. This, however, Dr. Drummond tells us is likely to lead to a false sense of security, and there is every necessity to guard against the evils which may arise from the gradual transition to purely artificial foodstuffs which is taking place.

Chemical Warfare Again

SIR EDWARD THORPE'S allusion to chemical warfare in his presidential address at Edinburgh has given a fresh start to this controversy, and it is still strange that eminent scientists accustomed to think in severely exact terms should be so loose in their views on this question. It appears to be assumed that the use of gas in warfare is the first example of the degradation of science to military uses, and that the employment of scientists on research work for war is a new and reprehensible policy. Professor Boycott, for example, declares it to be "incredible that any decent-minded man should now bring to bear on the problem of destroying their fellow men that disinterested devotion which alone secures progress in natural knowledge." Yet if he should make a tour of the great engineering works around Manchester he would probably find numbers of decent-minded men studying such problems as big gun manufacture, and colleagues equally intent on the study of propellants and explosives. What difference in principle is there between the chemist who is engaged on explosives and the chemist who is studying gases? Both know their discoveries may be used for the destruction of mankind, just as everyone engaged in naval or aircraft construction knows it. To accept war as a whole and then to boggle over this one new aspect or development of it is simply a confusion of mind.

When it comes to stopping or greatly restricting war, then, of course, everyone is with those who would abolish chemical warfare. But that raises the whole problem of disarmament, which is international, and can only be settled on an international basis. The means for chemical warfare can only be abolished by the suppression of chemical industries, and while a nation like Germany has the chemical resources at command, and has shown no squeamishness in the use of them, other nations must either trust to German chivalry not to take advantage of them or must develop a self-protective organisation for themselves. The latter line, unhappily, promises no relief from war, but rather the reverse. It is the old argument of two keels to one, which involves a policy of military and naval rivalry. If chemical warfare is to be stopped, as everyone would wish it to be, it must be stopped by international agreement, supported by adequate sanctions and guarantees, and not merely by pious protests against the employment of British chemists to undertake researches into lethal gases.

The Theorists of Labour

THE Trade Union Congress, Labour's Annual Parliament, has met and discussed almost every subject on earth except labour. It has demonstrated again the political character of the labour movement, and the distance it has travelled since the days when Trade Unions were first established. It has made known

what Labour thinks about Ireland, the Washington Conference, the Peace Treaty, disarmament, education, local government, national taxation, and a host of other questions which many still find it difficult to associate with Labour. No doubt the Wesleyan Conference, the Society of Electrical Engineers, the Police Union, and other worthy bodies have views about Ireland, but they have so far refrained from expressing them in their corporate capacities. We are optimistic enough to look forward to the day when the Unions will meet as Trade Unions, and discuss trade questions. When that arrives, such matters as "ca-canny," limitation, restriction, demarcation of functions, and similar topics, may receive the attention of those "brains" which have joined with the "hands" to form the modern labour movement. The brains have, no doubt, worked hard enough to devise these innumerable means of handicapping industry, but they are wise enough, when they appear in public at the annual Trade Union Congress, to confine the discussion to extraneous matters of current politics.

As a race the English are supposed to be rather fond of self-depreciation. From this point of view the labour movement is to some extent un-English, or possibly the exception which proves the rule. A verbatim report of the proceedings of the Trade Union Congress does not in any line or sentence suggest the possibility that any English labourer is lacking in efficiency or falls short of perfection. None of these delegates seems concerned whether any of the men they represent could by taking thought become more useful members of society; they are apparently content that the labourer is all that he could or should be, and that everybody else is wrong. It is true that the economic pressure of unemployment has of late given a different tone to these discussions between labour experts. They are less bombastic than they were, but they are still completely unconscious that some of the troubles which have come upon them may be due to their own shortcomings. This is in essence Prussian, and it cannot last in this country. The time must come again when the Trade Unions will recognise their true functions as business organisations, and devote their thoughts and discussion to business matters. They will then turn their attention to construction instead of to destruction, and British industry will once again lead the world.

Chemistry and Civilization

THE lectures on "Chemistry and Civilization" delivered by Dr. A. S. Cushman at the Wagner Institute of Science, Philadelphia, and now published by E. & S. Livingstone, Edinburgh (Pp. 151, 15s.), have already been anticipated to some extent by well-known writers such as Tilden, Thorpe, and others. His sketch of the early stages of chemistry, his account of the atomic theory, his notices of eminent chemical workers, and his views on the applications of chemical knowledge to industry are, therefore, less new on this side than they may have been to his hearers. The same remark applies to his remarks on chemical warfare, of which we have heard perhaps more than enough of late, and on the processes for the synthesis of ammonia, which have been very fully covered in recent official publications. And even H. G. Wells, picturesque and suggestive as his visions of the future always are, is hardly accepted over here as our first authority on chemical or other scientific developments. Without breaking very much new ground, however, the author's sketch of chemical history serves a purpose, and may appeal to a popular rather than to a severely scientific constituency. Whether the relation of chemistry to civilization is the real theme of the book is a little doubtful, and a less spacious title might, perhaps, have more accurately described its purpose.

The Calendar

Sept. 7–28	Shipping, Engineering and Machinery Exhibition	Olympia.
12–17	Seventh National Exposition of Chemical Industries	8th Coast Artillery Armoury, New York.
17	British Association of Chemists: Council Meeting	Midland Hotel, Manchester.
19	Royal Photographic Society of Great Britain: 66th Annual Exhibition	35, Russell Square, London.
21–23	Institute of Metals: Annual Meeting	Birmingham.
28	Faraday Society: General Discussion on "Catalysis with Special Reference to Newer Theories of Chemical Action."	Institution of Electrical Engineers, Victoria Embankment, W.C.2.
Oct. 5	Chemical Industry Club: Address by Sir William J. Pope, K.B.E., on his impressions of his tour in Canada	2, Whitehall Court, London.
7	Society of Chemical Industry: Manchester Section: Chairman's address, "The Disposal of Waste Liquors."	Textile Institute, 16, St. Mary's Parsonage, Manchester.
8	Mining Institute of Scotland: General Meeting	Edinburgh.
9–12	Société de Chimie Industrielle: Annual Meeting	Conservatoire National des Arts et Metiers, Paris.
17	Chemical Industry Club: Annual Meeting	2, Whitehall Court, London.
29	British Association of Chemists: Annual Meeting	Midland Hotel, Manchester

Books Received

MINING PHYSICS AND CHEMISTRY. By J. W. Whitaker. London: Edward Arnold & Co. Pp. 268. 9s. net.

BIOLOGICAL CHEMISTRY. By H. E. Roaf, M.D., D.Sc., &c. London: Methuen & Co., Ltd. Pp. 216; 10s. 6d.

MINING PHYSICS & CHEMISTRY. By J. W. Whitaker, B.Sc., A.I.C. London: Edward Arnold & Co. Pp. 263; 9s.

HISTORY OF CHEMISTRY. By Sir Edward Thorpe, C.B., LL.D., F.R.S. Vol. 1. London: Watts & Co. Pp. 152; 7s.

AGGREGATION AND FLOW OF SOLIDS. By Sir George Beilby. London: Macmillan & Co. Pp. 256; 20s.

INTRODUCTION TO TEXTILE CHEMISTRY. By H. Harper, A.R.C.Sc. (Lond.), B.Sc., A.I.C. London: Macmillan & Co. Pp. 189; 3s. 6d.

TEXTILE BLEACHING. By Alec B. Steven, B.Sc. (Lond.), F.I.C. London: Sir Isaac Pitman & Sons, Ltd. Pp. 134; 3s.

SOIL CONDITIONS AND PLANT GROWTH. By Edward J. Russell, D.Sc., F.R.S. London: Longmans, Green & Co. Pp. 406; 16s.

THE PHYSICAL PROPERTIES OF COLLOIDAL SOLUTIONS. By E. F. Burton, B.A., Ph.D. London: Longmans, Green & Co. Pp. 221; 12s. 6d.

Society of Chemical Industry

Reports and Proceedings at the Montreal Meetings

We give below abstracts of a number of papers read at the Annual Meeting of the Society of Chemical Industry at Montreal, together with further notes by "L. A. J."

Some Personal Impressions

By "L. A. J."

Montreal, *August* 30.

THE round of continued entertainment and excitement has never ceased. More gentlemen of the Montreal Committee met us on arrival at the Bonaventure Station on Monday last, of whom Mr. Matheson, the Chairman, and Mr. Hazen have been particularly indefatigable. Our hosts have thrown open their houses to us and spared themselves not at all in their efforts to entertain us. Nothing has been too much trouble and nothing has been left undone. Our hosts seem to have really enjoyed our visit as much as we have ourselves. The Old Country is very dear to the hearts of these people, whether they have been on this side of the water many years or few. It is on such occasions as these that one realises what a poor affair human life would be without memory—and memory is the breath of life to English Canadians. They can show a patriotic Englishman how to appreciate England, and there will be at least some Englishmen who will profit by the lesson. Would that some other Englishman could be here too!

Ties of Friendship

There is no doubt that this visit and similar visits which may be planned to other parts of the world, will be materially advantageous in strengthening the ties of friendship and understanding which already exist, not only to those who actually participate, but to a wide circle throughout the civilised world.

Sir William Pope struck the same note in reply to the address of welcome at McGill University. He deplored the fact that there were not more of the notable representatives of English chemistry present at this meeting, but he emphasised the value of the presence of the young men who are with him, in so far that they will later have to guide not only the activities of the Society of Chemical Industry, but possibly things of greater moment still. It is fitting, therefore, that they should meet men of affairs in this Dominion and learn the lessons to be learned whilst still young.

Shawinigan Industries

Visits to the industrial chemical plants at Shawinigan and Toronto take place after the meetings of August 29-31, but we have already had opportunities of seeing something of Canadian industry in the immediate neighbourhood of Montreal. Most of the manufacturing industries, including the chemical ones, are situated in the province of Quebec, and roughly they are found between Toronto on the west, and a few miles beyond Montreal on the east.

Canada is essentially an agricultural country and it is going to be more so in the future. Its chemical industry is therefore primarily connected with agriculture and food products; after that the most important, perhaps, is the manufacture of pulp and paper. Raw material abounds, there are large areas of virgin forest, and it is largely located in Quebec and Ontario provinces. The importance of paper is adequately emphasised by the Conference, and there is no doubt that this industry is expanding rapidly. Then there are the more strictly chemical works centred around Shawinigan in connexion with the manufacture of acetic acid and the many possibilities arising from proper treatmentof the acetylene molecule. This subject, like the mines of Canada, is but scratched, but we must return to that later after visiting Shawinigan. In this work and in a thousand other ways it is evident that the power supply is the key to the situation, more so in the future than in the past.

Hydro-Electric Developments

There is ample hydro-electric power for everything, and it appears that only a fraction of the potential development has been secured. In Montreal city hydro-electric power runs the tramways and is also the principal illuminant. The city is a blaze of light all through the night apparently because the power is cheaper than labour or mechanical devices to extinguish the illuminated signs at a reasonable hour. The same condition is evident at the various factories that we have visited: for example, the Canadian Electro Products, Ltd., who generate hydrogen and oxygen gas using town supply electricity at about ¼d. per unit. These people can compete against oxygen obtained by the liquefaction of air.

At the Dominion Engineering Co.'s premises we saw something of the future of hydro-electric power development. Here work is going on with some of the largest machinery ever made for power development. We saw a machine being assembled to develop 10,800 H.P. with the comparatively low head of water of 34 feet. The total weight of the unit, including housing, is 600 tons, the revolving element weighing 240 tons (of which the actual rotor of the turbine weighed 70 tons), the speed to be 59 revs. per min. There was also in hand a 20,000 H.P. unit which worked on a 70-ft. head of water and had rather a different appearance. The design of all these large machines is developed from 16-inch diameter working models, and from these models the proper curvature of the blades for maximum efficiency is developed.

A power unit for Shawinigan, is being made at this factory, and the stator—a one-piece casting 29 ft. in diameter—was mounted and revolving on the table of a milling machine at the time of our visit. There are some extraordinarily large machines of all types in these shops, and it was pleasing to see Hulse & Co., Ltd., of Manchester, represented by a boring machine said to be the largest on the American continent.

Sugar Manufacture

An enjoyable morning was spent at the St. Lawrence Sugar Refining Company's works. The directors showed the party everything and explained the process at great length. The peregrinations of a sugar crystal from the humble cane to its last home are many and varied, but the general opinion seemed to be that if ever it reached the refinery at Montreal, then it was in for a particularly harassing time.

Other visits were also greatly enjoyed, especially those to the Angus shops of the C.P.R., where repair work and new erections are going on (this visit was arranged by the kindness of Dr. Milton Hersey, a director of the C.P.R.), and also the Gillette Safety Razor Company, where some fine machines seemed to be almost uncanny in the precision of their actions.

One of the chief social events of the week was the dinner given by Dr. Ruttan, the President elect, in honour of Sir William Pope, at which various distinguished men of affairs were invited to meet him. The company included Sir Herbert Holt, Sir Charles Gordon, and others prominent in the business and civic life of the City of Montreal.

On Thursday afternoon a visit was made to the Laval University (French Catholic), of Montreal, at which Sir William Pope greatly delighted the French hosts by addressing them clearly and expressively in the French tongue.

On Friday afternoon the party were entertained to lunch aboard the steam yacht, "Sir Hugh Allan," by Mr. Ross, the Chairman of the Harbour Commissioners of the Port of Montreal. A most enjoyable afternoon was spent steaming around the harbour and the island, and inspecting the grain elevators. Though few noticed the significance of it, the vessel berthed by the lock at the outlet of the Canal which runs from the St. Lawrence River to the foot of Lake Ontario and so to the head of Lake Superior, over 1,200 miles from Montreal.

It is impossible to leave this area, as we must do shortly, without saying something about the glorious country we have seen in this fertile valley of the St. Lawrence and its people.

Hospitality

Firstly, no one should have been allowed to undertake a journey of this nature without having taken at least a short course in Canadian history and geography. Our woeful ignorance collectively has obviously quite often taken our hosts aback. By the time we return, however we shall be well informed In passing through the country as we have

done, it is easy to note from the mouth of the St. Lawrence onwards, how the mountains (the Laurentians on the North, the Alleghanies on the South) gradually recede, exposing to view the fertile alluvial valley through which flows the mighty St. Lawrence, the overflow of the Great Lakes. This valley is the most settled and prosperous area in the whole of Canada and holds one-third of its entire population. It is peopled largely by French Canadians, who whilst being the direct descendants of the original French settlers, speaking the language and preserving the customs of old France, have a strong admixture of Scottish Highland blood which was given to them by the men of the Highland regiments disbanded in Canada after the wars. The French Canadians are passionately attached to the soil, the farms being occupied by their owners. They are solid in their work, in their religion and in their pride at being a part of the British Enpire. We have been privileged to meet many of these people, and none could fail to mark the delightful courtesy and attention that we have received at their hands.

Action of Thiocyanates on Cellulose

Their Utilisation as Solvents

At the annual meeting of the Society, held in Montreal from August 29–31, a paper on "The Action of Thiocyanates on Cellulose," by R. H. Clayton and H. E. Williams, was read by Mr. Clayton. The authors were directed to this subject as a consequence of studying concentrated solutions of the metallic thiocyanate. It was found that hot solutions of certain thiocyanates, notably those of Sr, Mg, Mn and Li, dissolved cellulose, and also that the value of any particular thiocyanate as a solvent for cellulose could be determined from a consideration of physical properties of the solution. These physical properties are viscosity, heat of dilution and boiling point, and the relations between them may be expressed in a three-dimensional diagram. To be a solvent, the salt must have a positive heat of dilution between well-defined limits, and the solution must have a minimum viscosity.

If the salt solution is not a cellulose solvent *per se*, it may possibly be made so by the addition of any other salt not necessarily a thiocyanate, provided the physical properties of the mixed solution fall within the three-dimensional diagram. Suitable salts generally must have the following properties: (1) High solubility in water; (2) high boiling point in concentrated solutions; (3) suitable viscosity and of a positive but not too great a heat of dilution; and (4) mixed salts not to react chemically.

The paper then largely dealt with the effect of calcium thiocyanate solution on cellulose alone and in conjunction with calcium chloride, which admirably fulfils the conditions outlined above.

Mixed Solution

These mixed solutions are convenient and cheap to use, and have valuable possibilities of industrial applications, such as spinning of filaments, mercerisation of cotton, parchmentisation of paper and the preparation of vulcanised fibre.

A neutral solution of calcium thiocyanate (sp. gr. 1·2, B.pt. 135°F.) will dissolve bleached cotton or chemical wood pulp at 80°C. to 100°C.; but solutions boiling below 133°C. or above 150°C. will not dissolve cellulose. In the latter case this reduction of the hydrating action on the cellulose is a direct result of increased concentration of a very soluble salt with a positive heat of dilution. Such a salt will hold the "associated" water with increasing affinity until, with solution boiling at 150°C. or over, the effect is definitely one of dehydration, resulting in parchmentisation. In preparing concentrated solutions of cellulose up to 10 per cent. it was found that the addition of 3 to 4 per cent. of glacial acetic acid to the thiocyanate solution eased the process of solution. In absence of acetic acid the fibres swell enormously before passing into solution, and in consequence the mass is apt to pass through an intensely thick and gelatinous stage.

Calcium Chloride Thiocyanate Mixtures

Apart from the question of cheapness, which is important in considering the possible use of calcium chloride thiocyanate mixtures, it is claimed that in some respects a mixture of equal volumes of the two solutions (each originally of such a concentration that they boiled at 140°C.) is superior to the thiocyanate solution alone as a solvent for cellulose.

The Formaldehyde Reaction

Further increase in the proportion of calcium chloride in the mixture is of no value, the heat of dilution of the mixed solution being too great. Mr. C. F. Cross, F.R.S., who has taken a deep interest in the work, and has observed that by the addition of 25 per cent. of formaldehyde (45 per cent.) to the thiocyanate solution, chemical wood pulp will dissolve in the cold, and solutions containing up to 4 per cent. cellulose have been made in this way. With calcium chloride mixtures the formaldehyde reaction is retarded, probably due to the powerful dehydrating action of calcium chloride. The addition of formaldehyde to the thiocyanate solution lowers the surface tension, but does not materally lower the viscosity and the heat of dilution, whilst the addition of water considerably lowers the viscosity and the heat of dilution without appreciably altering the surface tension.

The 50/50 solution of chloride-thiocyanate as described, but further concentrated until its potential boiling point is 155°C., makes an excellent parchment paper if it is in contact for 30 seconds with the bath maintained at 130°C. Compared with the parchmentising processes, an excellent product is obtained easier to handle in the washing, which need not be unduly hastened, as is the case with the sulphuric acid method. And, above all, the whole operation can be carried out economically, the recovery of the bath liquor being very high. The mechanical tests on the product are very good. By adjustment of the bath, composition and temperature, just sufficient surface solution may be obtained to cement the leaves well together in the manufacture of vulcanised fibre resembling vegetable ivory in hardness and workability.

It is quite clear that the method is far superior to the zinc chloride process for this class of work, more particularly by reason of the fact that very little washing is required by comparison. The mercerising effect on cotton, whilst good, has not yet proved superior to the caustic soda process.

Briquetting of Lignites

Results of Recent Experiments Summarised

In a paper on the above subject Mr. L. R. Thomson, M.E.I.C., described the work that has been done on lignite briquetting by the Lignite Utilisation Board of Canada since its inception in October, 1918, and illustrated his paper with a number of diagrams, drawings and tables of results.

The Provinces of Manitoba and Saskatchewan are largely dependent upon American anthracite coal for domestic heating purposes, and during the years preceding the war about 500,000 tons were imported annually. The price of this imported coal naturally increased as one went westward owing to the higher freight charges. It continued to find a market until the price went so high that the consumers were willing to put up with the disadvantages of the much cheaper Alberta coals. This "peak" line runs in a general north and south direction through the eastern part of Saskatchewan. Directly beneath this area, however, there are very large deposits of rather low-grade lignites, which, after carbonising and briquetting, are capable of being converted into a fuel possessing high calorific value.

The Lignite Utilisation Board was therefore established by the Canadian Honorary Advisory Council for Scientific Research to attack this problem and, if possible, to demonstrate the feasibility of producing a satisfactory domestic fuel from these lignites by the method of carbonising and briquetting. The board is composed of three members: Mr. R. A. Ross, D.Sc., chairman, representing the Dominion Government; J. M. Leamy, M.E.I.C., representing the Manitoba Government; and the Hon. J. A. Sheppard, representing the Province of Saskatchewan. Mr. Leslie R. Thomson (the author) is the secretary, and the technical staff includes Mr. Edgar Stansfield, M.E.I.C., and Mr. R. A. Strong (chemists), and Mr. R. De L. French, M.E.I.C. (engineer).

After preliminary experiments at the Fuel Testing Laboratory of the Department of Mines, Ottawa, a plant was designed and erected at Bienfait, Sask., to have a capacity of one hundred tons of briquettes per day; this plant has recently been put into operation.

At Bienfait the lignite is first carbonised by heating to a low temperature in order to drive off the more volatile portion, and the residue is mixed with a coal-tar pitch binder under suitable control, and after grinding together the mixture is

pressed into briquettes in a roll press. The briquettes weigh about two ounces each, and are egg shaped. The average approximate analysis of the raw lignite used and of the finished briquette is :—

	Raw Lignite. Per cent.	Carbonised Briquette. Per cent.
Moisture	33 ...	4·3
Volatile combustible matter	26 ...	19·4
Fixed carbon	32 ...	59·8
Ash	9 ...	16·5
British Thermal Units	7,100 ...	11,280·0

A summary of the Board's briquetting results may be presented as follows : (1) It has been possible to make a first quality commercial fuel briquette from carbonised lignite using any one of such binders as coal tar pitch, petroleum pitch, hardwood tar pitch, sulphite liquor pitch, or by using combinations of them. (2) The quantity of binder required is much in excess of that necessary to make a correspondingly good briquette from anthracite fines. (3) A waterproof briquette of carbonised lignite cannot be made using sulphite pitch as a single binder unless the briquettes are subsequently subjected to heat treatment. (4) The choice of binder does not rest so much with the technical difficulties involved in its use, but with the economic supply of that particular binder. In other words, the Lignite Board has succeeded in making good briquettes from many binders. (5) The Board has decided to use as a binder coal tar pitch supplied by the Dominion Tar and Chemical Company from Sault Ste. Marie, for the preliminary period of operation.

Synthetic Organic Chemicals

Manufacturing Methods at Rochester

In his paper on the "Preparation of Synthetic Chemically Pure Organic Chemicals," Mr. G. E. K. Mees first alluded to the status of chemistry at the present time as compared with that of ten years ago, emphasising the need for research and its co-operation with industry.

Before 1914, he said, the supply of synthetic organic chemicals was entirely in the hands of one or two firms in Germany. With the outbreak of hostilities, this supply was cut off and the effect was soon felt ; many researches had to be abandoned. Professor C. G. Derick, of the University of Illinois, met the situation by inviting the most promising students to work during their vacation on those organic compounds most needed by the department. This was a unique step, the reactions being conducted on a scale unusual in research work. As it was very evident that the supply of organic chemicals was inadequate, the Eastman Kodak Co. in 1918 decided to enter the field, having no prospect of immediate profit, high labour costs, materials more expensive than previously, and, finally, trained and capable chemists practically unobtainable. The work undertaken was :— (1) Synthesis of compounds which are not prepared technically but are required for laboratory purposes. (2) Purification of technical materials got from chemical manufacturers. (3) Distribution of such technical chemicals in form in which purchased.

Raw materials were obtained largely from dye, dye-intermediate, perfumery, explosives and pharmaceutical chemical manufacturers, also from individuals in university and other laboratories. The chemicals produced are classified under :—(1) The Eastman chemicals (highest possible purity). (2) The practical chemicals (purity sufficient for synthesis). (3) Technical products (as from large-scale manufacturers).

Girls were at first employed (men then being out of the question) in an improvised laboratory. After two years they were transferred to a new specially designed laboratory, all the work being done on a purely laboratory scale. Filtration is carried out principally in the usual Buchner suction funnels. Heating is usually effected by means of a free gas flame under a wire gauze, oil-bath or calcium-chloride bath. For certain purposes steam-jacketed kettles are used. Distillation is carried out entirely in glass, flasks with long side-arms being employed in order to avoid contamination from stoppers ; the receiver acts as the condenser by means of a stream of water. The same principle is employed for vacuum distillation. For fractional distillation a column of special design is employed, a current of air (easily controlled) being passed down through the outer jacket. Steam distillation is extensively employed, an all-metal condenser being used if possible.

Vacuum Distillation

In case of less volatile compounds, vacuum distillation in a current of superheated steam is found invaluable. The principle of the vacuum pan has also been adapted to laboratory uses. Stirring is in all cases carried out by means of the centrifugal stirrer, made of glass. For large work one of iron, and belt driven is employed. Extraction with various solvents and separation is done in the usual way, e.g., in glass vessel, hand-shaken ; separatory funnel ; a semi-automatic device for larger amounts of liquid ; also a modification of the Soxhlet apparatus. Pyrex glass is used exclusively in the laboratory.

From the financial point of view, the work has been conducted at a considerable loss, the first year showing a loss exceeding $14,000. This result was due to the attempt to cover a wide range of chemicals and make them available in as short a time as possible, instead of making profitable ones, in good demand. At present, however, things are much more hopeful, due to the greatly increased number of chemicals available, the wider knowledge of the existence of the department throughout the country, and the improved methods of preparation and lower costs.

Heat Intercepting Glasses

The Importance of Annealing

Professor Alleman, in introducing the subject of Heat Intercepting Glasses, described how silver nitrate when exposed to the action of light passing through ordinary glass is discoloured, while if placed in a container of special glass no change is noticed. Similarly smoked bulb thermometers exposed under the same conditions will record different temperatures, that in which ordinary glass is used showing a higher temperature than that protected by the special glass.

Sir William Crookes, who was the first to investigate glass with the object of securing a spectacle glass which would protect the eyes from heat and ultra-violet rays and reduce glare, concluded that cerium salts were most effective in this way, and black mica added to the melt produced a glass which almost completely obstructed the invisible heat rays.

About five years ago Mr. Sherman, then chief chemist of the Pennsylvania Wire Glass Co., conducted 227 experiments, using various mixtures and confirmed Crookes' work, and produced a more brilliant glass by a slight manipulation of the furnace temperature. This material is now a commercial product known as actinic or heat intercepting glass, and is used in the manufacture of plate polish, plate wire, plate roof wire, aqueduct wire, ribbed wire and corrugated wire glass.

These different types were described, emphasis being laid upon the importance of annealing. An instance was given of the resistance of the corrugated wire glass to shock. A 2¼ in. steel smoke stack 24 in. in diameter and 25 ft. in length fell in a severe wind storm on the corrugated wire glass roof of a large boiler house. While two plates were destroyed, and the remainder of the glass was cracked or bent, it was not shattered, and did not leak although the steel beams on which the glass rested were bent about 3 in. out of line. In addition to the advantages regarding the transmission of light the absorption of heat and the elimination of glare, the use of this glass as a structural material would be valuable for the erection of fireproof permanent buildings. Cables were shown covering tests made on houses erected of the various types of heat intercepting glass, showing the marked difference between the temperatures inside and outside the house and also showing the high percentage of light transmitted, the lowest being 72 per cent.

In conclusion, Professor Alleman said that large amounts of this glass have already been made and used. It was used in the construction of the largest hangar in the United States, the purpose of its employment being the prevention of injury to the fabric of balloons by the sun's rays. It is also used on the roof of the Indianapolis Railway shed, which is entirely free from glare and the coolest structure of its kind in the summer.

Pure Hydrogen Peroxide

Some of its Properties and Applications

In his paper on "The Properties of Pure Hydrogen Peroxide," Dr. Maass referred to a research carried out at the McGill University.

Hydrogen peroxide is the name commonly applied to an article which may be procured in any drug store, but this really consists of a 3 per cent. aqueous solution which also generally contains inorganic salts, a little acid and other impurities. The water and other impurities are removed in three stages. The first consists of a vacuum concentration and distillation to a 35 per cent. pure aqueous solution; this is then concentrated to a 90 per cent. solution, and the latter subjected to fractional crystallisation on the end product of which is the 100 per cent. Special apparatus was designed for this work, including a sulphuric acid pump, which alone made it possible to obtain large yields. Strong solutions of hydrogen peroxide were prepared in the past, and were reputed as being highly explosive, and several serious accidents are recorded. This instability is due to the presence of impurities. Pure acid free hydrogen peroxide is not explosive.

Contamination by Acid

Hydrogen peroxide solutions are used as a disinfectant, and are excellent for this purpose. The presence of acid beyond a certain amount, however, renders it harmful, and the manufacturer now takes great care in this connexion. In the case of 100 per cent. hydrogen peroxide the temporary application to healthy tissue is to bleach it an intense white; no blister results. After a few hours the place where the application was made is perfectly normal. Diseased tissue, on the other hand, is destroyed. Here also, if the peroxide is contaminated by acid, it causes a severe burn.

At ordinary temperatures the 100 per cent. peroxide is a transparent liquid with about the same viscosity as water, but one and half times as dense, and with a much greater refractive power. Many of its physical properties were measured. It is very active chemically; a speck of metallic sodium causes it to explode with extreme violence. The properties of the pure peroxide are of particular theoretical interest, and many new reactions can be studied and new compounds made with the 100 per cent. peroxide. The National Drug & Chemical Co. of Canada greatly assisted the carrying on of this work by supplying the chemicals required, with a view to furthering scientific research.

Recovery of Peat

The Air-Drying Method Described

Dr. Ernest V. Moore in his paper on "The Recovery of Peat by Air Drying," described a practical method of turning raw peat into a product of economic value. Peat is a combustible substance produced by slow decomposition of vegetable matter and occurs saturated with water in peatbogs typical of the northern hemisphere. To transform raw peat into combustible material it is necessary to reduce its water content of 90 or 95 per cent. to about 30 per cent. Drying is best effected by evaporation in the open air.

The difficulties of collecting peat are overcome by gathering it with a combined excavator and macerator which is supported on caterpillar-tread carrying elements—a device more useful than rails on a soft peat bog. The raw peat is carried by a belt conveyor from the macerator to adjoining higher land where it is spread from 3 to 6 inches thick on the ground, cut into blocks and allowed to dry in the sun. The blocks are turned to insure uniform drying and in from 30 to 40 days the moisture content drops to 30 per cent. and the peat is ready for domestic use or even for some industrial uses—especially drying operations where a very clean fuel is necessary.

Valuable By-products

Although peat has not been available in sufficient quantity for extensive investigation, progress has been made in turning air-dried peat into more efficient fuel by briquetting by drying and pulverising, or by converting it into fuel gas or electricity and recovering valuable by-products in the same operation. It is also possible to produce from peat high grade charcoal or coke and at the same time to recover valuable by-products. In the United States the use of peat as a fertiliser is very extensive.

Though air-dried peat has twice the volume of an equal weight of coal, Dr. Moore declared that the average householder would gain by replacing 20 per cent. of his anthracite pound for pound with air-dried peat. Following his paper on peat, Dr. Moore showed a series of lantern slides taken at the experimental plant operated by the Peat Committee at Alfred, Ontario, and finally a moving picture reel showing some of the machinery in operation.

Chemistry of Rubber

The Isolation of Crystalline Substances

In a paper on "Some Observations on the Chemistry of Rubber" Professor G. S. Whitby touched on a variety of points of interest in the researches which he and his co-workers have recently conducted at McGill University into the chemistry of raw rubber and the vulcanisation of rubber. He described an investigation of the resin of rubber, which represents the first successful attempt to elucidate in some degree the problem of the chemical nature of a constituent of raw rubber which, although present in only a small proportion, has an important influence on the behaviour of the rubber when the latter is vulcanised and in other ways. Dr. Whitby's investigations show that a considerable number of crystalline substances can be isolated in small amounts from raw rubber. One of these substances is an interesting sugar-like body, which was known to occur in rubber latex, but the presence of which in prepared rubber was unexpected, on account of its great solubility in water.

Vulcanisation Accelerators

Experiments were described on the artificial conversion of rubber into a resin as a result of the absorption of oxygen from the air under the influence of catalysts. One mode of carrying out this conversion which Dr. Whitby has worked out may lead to the production of lacs or varnishes from rubber. The study of this conversion is also of importance because of its relation to the "perishing" of rubber goods.

Within very recent years it has become the practice in the rubber industry to hasten vulcanisation by the use of small amounts of certain organic chemicals known as vulcanisation accelerators. Dr. Whitby outlined the results of a systematic study of a number of such substances and particularly described results with one accelerator which had been found to be so active that truly remarkable results were obtainable by means of it. This accelerator increased the speed of vulcanisation by 300 to 400 times and was probably the most powerful speeder of vulcanisation hitherto known. Dr. Whitby drew attention to some of the interesting and hitherto unrealisable improvements in rubber manufacture which the employment of such substances made possible.

Death of Mr. H. E. Pollock Hodsoll

THE death is announced after a long illness of Mr. H. E. Pollock Hodsoll, F.C.S., chairman of Messrs. Renny Forbes & Co., Ltd., Alperton, Wembley, London, agricultural and horticultural fertiliser manufacturers. Mr. Hodsoll, who was 44 years of age, was a scholar of the South-Eastern Agricultural College, Wye, and in the early part of his professional career a lecturer at the Colonial College, Hollesley Bay. He was then appointed Inspector of Agriculture in the Soudan under the Government, and upon his return to this country in January, 1908, joined the board of directors of Messrs. Renny Forbes & Co., Ltd., becoming chairman in November, 1916. Mr. Hodsoll read papers and deivered lectures before the Royal Horticultural Society and other agricultural and horticultural bodies, several of his papers being printed in the Proceedings of the various societies. To the issue of the *Journal of Pomology* for August, 1920, he contributed an article describing the results of several years' experiments at Mr. H. S. H. Bickham's fruit farm at Ledbury, Herefordshire, with a new system of manuring fruit trees for continuous cropping and counteracting the biennial habit of fruiting in certain varieties of apples. The subject, which attracted much attention, was taken up in the *Fruit-Grower*, and led to interesting correspondence. Mr. Hodsoll was well known among fruit and hop growers, and his death deprives the industry of a worker who contributed much by patient investigation and research to place pomology on a sound basis.

Sir William J. Pope on Chemistry and Life

Address to the American Chemical Society

The following address was delivered as a contribution to the symposium at the opening meeting of the American Chemical Society in New York on September 7.

ALTHOUGH chemical science has developed gradually and continuously and without any marked break of continuity during more than a century past, it is possible to discern the existence of a progressive change in the character of the practical methods applied by the chemist. This is especially the case in connexion with organic chemistry. In early days, discoveries were made largely as the result of acts of violence perpetrated upon chemical materials; delicate organic substances were distilled through red-hot tubes, and indeed the most ordinary weapons of chemical research were those in which energy at a high potential was employed. During the last fifty years the organic chemist has forged for himself new tools in which low potential energy is applied; we are now in possession of numbers of stock methods of working in which the temperature changes concerned are very small, and in which low potential energy is induced to take a part by the presence of a so-called catalyst.

Newer Methods

The newer and less violent chemical methods have supplemented the older ones in an extraordinary degree, and our knowledge of the science of organic chemistry has grown out of all recognition during the past half century; apart from this, however, the direction in which experimental methods have developed presents another aspect of great significance. The chemical methods by which plants and animals conduct their laboratory operations, by which they absorb their food, and by which they elaborate highly complex organic compounds, are invariably methods in which low potential energy changes are involved; no considerable temperature variations are permissible and, in fact, the animal organism dies as a result of temperature fluctuations of but a few degrees. It is obvious that organic chemistry is approximating in its experimental methods to those which occur exclusively in plant and animal life; the ultra-modernity of the chemistry of vital processes becomes the more evident when we reflect that those processes are carried on in colloidal media, and are brought about by the agency of catalytic agents. Notwithstanding the early recognition by chemists of the importance of colloids and of catalysts, the systematic study of these potent agents is of comparatively recent date.

The significance of the subject before us may be accentuated by considering the operations performed by an ordinary plant leaf. The leaf carries, more particularly on its under side, minute ducts or tubes, the stomata, which absorb carbon dioxide from the air; oxygen in equal volume is simultaneously excreted. Sunlight is necessary to this operation, and it is known that the only component of light which is active in stimulating the absorption of carbon dioxide is that which is absorbed by the chlorophyll, the green colouring matter of the plant. Chlorophyll is thus in some way implicated in the excretion of oxygen; so powerful is the catalyst that carbon dioxide is absorbed by the stomata more than fifty times as rapidly as would be the case were they filled with caustic potash solution. The absorption of carbon dioxide, and the evolution of oxygen in presence of aqueous liquids, coupled with the production of starches and sugars in the plant, leads naturally to the suggestion that formaldehyde is the first product of the chemical change which takes place, and a good deal of evidence has been adduced to prove the actual, though transitory, presence in the plant of this aldehyde, which we know undergoes polymerisation under suitable conditions with formation of sugars.

Chemical Activities of Plants

Hitherto, the actual mechanism involved in the utilisation of atmospheric carbon dioxide in the vital processes of the plant has not been elucidated; clearly, however, it is one in which profound use is made of several of the most modern objects of study by the organic chemist, of reaction in colloidal media, of the action of catalysts, and of the stimulation of chemical change by means of low potential energy. There is here subject for encouragement; the laboratory methods of organic chemistry have developed in a perfectly natural manner in such a way as to cause them to approximate more and more closely in kind to those employed in the plant. Our feeling of encouragement is intensified by the reflexion that a certain similarity marks all the vital chemical activities of plants and animals; we know that chlorophyll, which is in some way responsible for the absorption of carbon dioxide and the elimination of oxygen by the plant, is chemically intimately allied with the hæmoglobin of animal blood, which brings about the reverse operation, namely, the absorption of oxygen and the excretion of carbon dioxide. It is safe to prophesy that the next great epoch of organic chemical progress lies in the very near future, and that it will lead us to laboratory methods of imitating with considerable fidelity the complex chemical changes brought about in living matter by the utilisation of low potential energy

Future of Chemical Technology

If we believe this, the logical conclusion to be drawn from our present state of knowledge, and from the direction of development of method which has taken place during the acquisition of that knowledge, we must go further, and foresee the advent of entirely revolutionary consequences which will have wide bearings upon human affairs. The task of the chemical manufacturer has generally resolved itself into the conversion of specific raw materials, with the aid of expensive human labour and the use of coal, oil, water-power or other costly source of high potential energy, into finished materials marketable at an enhanced price, which includes the cost of labour and energy. In only a few instances has the technologist been able to avail himself of the activities of the living organism in the manufacture of his product; and in these, such as the production of alcohol, acetic acid, glycerol and acetone by fermentation, labour and fuel have generally to be introduced as costly auxiliaries. When we possess full working details concerning the plant-leaf process for converting carbon dioxide and water into formaldehyde and oxygen by utilising the sun's energy, when we can make indigo and quinine by the identical methods adopted by the plant, chemical technology will be an entirely different proposition from the one which it now represents. Not that we shall probably desire to replace the laboratory of living organisms as sources of natural product it is difficult to believe that the indigo plant, properly developed and properly worked up, is incapable of competing successfully with coal-tar as a source of indigo. The elucidation and imitation of plant and animal chemical methods will, however, provide us with means for manufacturing vast numbers of products which are unknown in nature, because the lower creation has no need of them; we are nowadays so far from nature that many such products may be of the utmost value to modern civilisation.

Utilisation of Solar Energy

Considerations of the kind which have just been advanced force upon us yet other reflections. Fuels and other sources of high potential energy are becoming more scarce, human labour is becoming more costly—that is to say, is becoming less willing to expend itself; on all hands we are met by the demand, and, indeed, by the expectation, that science will lift the curse of Adam from humanity. It is no part of my task to-day to discuss philosophical questions which originated in the Garden of Eden; but it seems plain that modern science is called upon to find means for curtailing the expenditure of such high potential forms of energy as human labour and mineral fuel. The solution of this problem must come from the proper utilisation of the radiant energy which comes to us from the sun; we require efficient methods for transporting solar energy from the tropics for use in our more temperate climes. It is perfectly possible that the scientific study of oil-bearing plants in tropical regions may lead to such improvements in yield and cost of production that vegetable oils will replace the ordinary fuels—coal and petroleum—now used the whole world over.

Nitrogen Compounds

Simultaneously, the problems which arise in connexion with the proper utilisation of our stores of nitrogen compounds will call for solution. At present, nitrogen is absorbed by vegetable matter, partly from manures and partly from the atmosphere, is then taken as food by animals, excreted, and in due course rendered again available for vegetable nutriment. Plant life is capable of absorbing nitrogen from very dilute solutions of nitrogen compounds, and converting it into the highly complex types of compound which alone are assimilable by animals; the lower type of living organism thus acts as a kind of middleman or purveyor with respect to the higher, and no reason seems to exist which would prevent an indefinite development of this particular function of the more lowly species of life—namely, the power of extracting nitrogenous products in solid concentrated form from very dilute solutions or, indeed, of absorbing nitrogen from the air. The development of this function, which always operates in the end by means of low potential solar energy, would render obsolete all those modes of fixing atmospheric nitrogen which depend for their performance upon the expenditure of high-potential energy, such as fuel and water-power.

Although a large number of technical chemical methods originated in Great Britain and France, the chemical technology of to-day is, in the main, modelled upon the pattern of modern German practice. This statement is more rigidly applicable to European conditions than to those of the American continent, where the discovery of vast sources of raw materials and of energy, dissimilar to anything which occurs in Europe, has necessarily led to a certain novelty of practice. I have no desire to depreciate the great achievements of the technical chemists of Central Europe, but I do suggest that we have shown far too little initiative in adopting, almost without modification, the economic views of chemical technology elaborated by the leaders of German industry during the last fifty years. The few colonies which the Central European nations possessed were a source of great expense to the homeland, because successful colonisation is an art which has never been mastered by any German Government; we have rendered our late enemies a great service by relieving them of this source of expense, and almost the whole of the tropical part of the globe is now being administered by English-speaking or by Latin races.

Intensive Production

The intensive production of organic substances of tropical vegetable and animal origin and the utilisation of these products for industrial purposes offer a great field for development at the hands of the technical chemist; we may anticipate that it might become possible entirely to replace petroleum as now used in internal-combustion engines by alcohol, or by vegetable oils, produced in the tropics. The elaboration of processes by which many valuable organic compounds may be obtained by the action of living organisms, so employing the low-potential energy delivered to us by the sun, also offers a very promising subject for study.

We must, indeed, recognise that wide economic differences exist between a self-contained European country and others which have the whole tropical world within their range, and that entirely distinct types of problems are in consequence presented to the chemical technologists of the two species of nation. It is for us to realise all the bearing of these differences upon chemical science and chemical industry and to see that we neglect no means for applying the great opportunities within our reach in the service of mankind and of our respective countries.

British Flint Glass Industry

MR. J. DONALDSON HARWARD, acting as secretary and on behalf of the Conference of the Flint Glass Industry, which met on September 5, at Stourbridge, to consider the course to be adopted in presenting a complaint to the Board of Trade, in pursuance of Section II. of the Safeguarding of Industries Act, has since had an interview with the officials of the Board and obtained further information as to the nature of the evidence the Board would require in support of such a complaint. The desirability of seeking relief under the Act also formed the subject of discussion at a special meeting of the Executive of the Joint Industrial Council of the glass industry, convened last week at Montagu House.

Edinburgh Honours for Chemists

Special Graduation Ceremony

A SPECIAL graduation ceremony was held in the McEwan Hall, Edinburgh, on Tuesday afternoon, for the purpose of conferring honorary degrees on certain delegates to the meeting of the British Association. Sir J. A. Ewing, Vice-Chancellor of the University of Edinburgh, presided, and Professor E. T. Whittaker presented the graduands for the honorary degree of Doctor of Laws.

Sir Edward Thorpe's name was received with loud applause. Professor Whittaker said their sympathies had gone out to him in the illness which had prevented him from delivering in person his presidential address. Sir Edward was one of the brilliant young chemists trained under Roscoe in Manchester. He was no stranger to Scotland, for his first appointment was to the Chair of Chemistry in the Andersonian Institute, Glasgow. In 1874 he went to the Yorkshire College, now the University of Leeds. Reference was made to the immense service he rendered by his investigations at the Potteries for the Home Office and to his work with Sir Arthur Hooker.

Professor Svante August Arrhenius, director of the Physico-Chemical Department of the Nobel Institute, Stockholm, said Professor Whittaker, by his investigations during the last thirty years, had formed the foundation of all work on electrolytic solutions and the constitution of molecules. He was supremely eminent as an investigator, and had also performed a great service to mankind by spreading the message of science among the people in a series of volumes which had enjoyed immense popularity.

Of Dr. Irving Langmuir, Schenectady, New York, Professor Whittaker said that his contributions to the present meeting of the Association had been among the most brilliant in the recollection of members. He was born in New York only 40 years ago, and his work lay in connexion with the General Electric Company. He had definitely solved the problem of the construction of filaments for tungsten lamps, and the results he had obtained had proved of the greatest importance in the development of wireless telegraphy.

Professor Robert Williams Wood, Professor of Experimental Physics, John Hopkins University, Baltimore, was known as "the prince of physical experimenters," Professor Whittaker remarked. Choosing as his field the interactions of light and matter, he had published a long series of brilliant investigations upon the properties of vapours. He had extended our knowledge of the spectral series and illuminated the obscure subject of dispersion.

Safeguarding of Industries Act

Appointment of Permanent Committee Panel

IN accordance with Section 7 of the Safeguarding of Industries Act, the President of the Board of Trade has appointed the following gentlemen to be members of the permanent panel from which committees, consisting of five persons, will be selected from time to time to consider and report upon complaints referred to them by the Board under Part II. (Prevention of Dumping) of the Act: Sir W. M. Acworth, Mr. J. Arthur Aiton, C.B.E., Sir William Ashley, Mr. Arthur Balfour, J.P., Sir George S. Barnes, K.C.B., K.C.S.I., Sir John N. Barran, Bt., Mr. J. T. Brownlie, Sir Cecil L. Budd, K.B.E., Sir James C. Calder, C.B.E., Dr. J. H. Clapham, C.B.E., Mr. T. P. Cook, Mr. F. R. Davenport, Mr. A. K. Davies, Mr. F. P. Dorizzi, Mr. Rayner Goddard, Sir E. C. K. Gonner, K.B.E., Sir George R. Lowndes, K.C.S.I., K.C., Professor D. H. MacGregor, Mr. Stanley Machin, J.P., Mr. G. A. Moore, Mr. J. W. Murray, D.L., Sir Douglas Newton, K.B.E., Mr. Owen Parker, C.B.E., J.P., Mr. R. G. Perry, C.B.E., Mr. Arthur Pugh, Sir R. Henry Rew, K.C.B., Mr. C. A. Russell, K.C., Mr. Arthur Shaw, Sir Charles Stewart, K.B.E., Sir Edwin F. Stockton, J.P., Mr. H. L. Symonds, Mr. Gilbert C. Vyle, and Sir Frank Warner, K.B.E.

There were 13,901,524 metric quintals of nitrate exported from Chilean ports during the first four months of the present year, according to information furnished by the Superintendent of Customs to the Chilean Treasury Department. Official statistics show that shipments of nitrate for the month of April amounted to 1,952,763 metric quintals.

The British Association Meeting at Edinburgh

Special Reports of Chemical Section Proceedings

THE sectional meetings began on Thursday, September 8, but, contrary to the custom in past years, the Sectional Presidential Addresses were not all delivered the same day. Section B (chemistry), however, adopted the usual procedure of having the presidential address read first. There was a very crowded attendance in the new university building to hear Dr. M. O. Forster give his address on "The Laboratory of the Living Organism," the substance of which appeared in THE CHEMICAL AGE last week. The presidential address was followed by a paper on a similar subject, by Prof. R. Robinson, F.R.S. This constituted the work of the section for the day.

Prof. W. Smithells, in proposing a vote of thanks to Dr. Forster, said it was customary to do so irrespective of the merits of the address. In the present case, however, they had had a really valuable address, which had traversed a very wide field, showing a delightful combination of wisdom and humour, and showing the power of combining abstruseness with lucidity. Speaking as an inorganic chemist, he would like to say how much he had enjoyed the summary which Dr. Forster had presented of the recent developments of biochemistry. Apropos of that, he would also like to say how very clearly this illustrated the continued usefulness of the British Association. The Association during the past year had been subjected to criticism, as it always had been during all the years he had known it, but the criticism during the past year had been particularly acute. The defence of the B.A., however, was easy, and amongst the defences was surely that the meetings of the B.A. gave an unrivalled opportunity to the chemical world in Section B to hear an expert give a summarised account of important researches which were known to a great many people only in a superficial way. Speaking as an inorganic chemist, and he was sure for all belonging to that branch of science, he expressed thanks to Dr. Forster for his admirable summary of biochemistry. The only other comment he would like to make was with regard to the remark of Dr. Forster that all important substances, except water, were organic. He personally was thankful to be left with water, for which there was a great deal to be said in many ways.

Prof. Burger seconded the vote of thanks, which was carried with acclamation.

The Genesis of Plant Pigments

Some New Hypotheses

The following is a brief abstract of the substance of Prof. Robinson's paper, which consisted very largely of working out on the blackboard the chemical formulæ involved in the explanation of his theory, for which, by the way, he did not claim more than partial confirmation experimentally.

Two types of naturally occurring substances containing a C_{15} nucleus can be distinguished—viz., those related to the sesquiterpene series, and probably derived by polymerisation of three isoprene molecules, and those which are most easily regarded as condensation products of carbohydrates. Santonin, for example, clearly belongs to the former class, whilst the greater number of plant pigments belong to the latter. The molecules of the flavones, flavonols, anthocyans and related substances contain two aromatic nuclei (*A* and *B*), which in different numbers of the series exhibit a varying state of oxidation.

Nucleus *A* is normally present as a derivative of trihydroxybenzene, whilst the normal condition of *B* is that represented by a dihydroxybenzene. This is the natural sequence of an hypothesis, the main feature of which is that each nucleus is derived from a hexose, and that these are connected by aldol-condensations with glycerose (dihydroxyacetone). The details of the molecular changes required in order to reach individual flavones, flavonols, &c., involve no unusual assumptions. Brazilin and hæmatoxylin are derived by the introduction of a molecule of formaldehyde to the complex, and the relation is very similar to that between the papaverine and berberine groups. The theory is extended to plant pigments of the naphthalene and anthracene series.

Prof. Morgan and Prof. Thorpe spoke in connexion with the paper, but neither were inclined to agree yet with the hypothesis put forward. Prof. Thorpe said that the experimental evidence in favour of the theory was very slender, and a great deal of further work would have to be done before definite views could be put forward.

Modern Dyestuffs Industry

On September 9, before the discussion on the Molecular Structure of the Atom, Prof. H. E. Fiertz, of Zurich, read a paper on the modern dyestuff industry.

After referring to the importance of the dyestuff industry, Prof. Fiertz said that the value of dyestuffs produced is very small compared to other world values.

Before the war £10,000,000 was invested in the industry, the goods produced representing 200 per cent. of this capital. This proportion, however, had undergone a great change, because whilst about £40,000,000 were invested the goods produced represented only 50 per cent. of the capital, the demand being rather smaller than before. Profits, which amounted to 16 per cent. in the average, had fallen to under 4 per cent., because the general expenses were very much greater than in preceding years; in the U.S.A., for instance, they were at least five times as large as in Switzerland.

Over-production

The large indigo plants, alizarine works and azocolour units had been cut into such comparatively small bits, and at the same time a very large over-production had set in. A strong factor of incertitude and unrest had set in, and the hoped-for profits were not realised, a fact which was scarcely surprising if one considered that it would very easily be possible to manufacture all dyestuffs required for the whole world in a plant much smaller than Vickers' or Krupp's steel works respectively.

The question before us was: How can things be arranged without losing most of the capital invested in the world's dyestuff industry? Two problems had to be faced:

1. The actual dyestuff industry must be developed; and,
2. The surplus of energy (capital and men) must be employed or else they are lost for this end.

The very first condition of any industry of colouring matters was excellent quality and absolute constancy in standard. Before the war even minute deviations in any property caused severe trouble. The second item was never relaxing progress. Any standstill meant steady falling off, and would lead to certain ruin, no matter how strong capital and determination might be at the beginning. This elimination had been witnessed forty years ago, and as history was ever repeating itself, it would do so again if the same mistakes were made. The test of efficiency was free export to the Far East. China and Russia, both as large as Europe, absorbed 50-60 per cent. of all dyestuffs produced.

The possible progress in the field of artificial colouring matters, although more restricted than 25 years ago, was still very considerable. Many of the existing products had become standard dyes. Alizarine, indigo, indanthrene, chrysophenine, chrome blacks, &c., were excellent, but we had no guarantee that any of these compounds would survive a serious attack by a new and better product. Indigo had to fight strongly against hydronblue, fast blues and sulphur dyes. Alizarine could not enlarge its field because strong competitors were appearing, and the tendency to employ better and even dearer dyes, a tendency originating in England, might kill many of the old friends, such as fuchsine, Bismarck brown, Congo red, and others.

One of the most important tasks of any dyestuff manufacturer was to produce goods of as high purity as possible. It had been found that pure intermediaries often gave rise to much better yields and to better shades. At the same time the fastness towards light and sometimes towards potting and milling increased very much.

New Manufacturing Processes

The tendency to obtain purer and cheaper products gave rise to a large number of new processes. We knew five different ways of producing H-acid, three for getting Chromothropic acid, three for the manufacture of Gamma-acid, &c. The very pure intermediaries enabled the works chemist to try new combinations, combinations which could be made with impure starting materials.

Alizarine was the best colour in existence but difficult to dye. Thus Congo Red had partly replaced this substance, although it was extremely bad except as regards its beautiful shade. This Benzidine colour was being gradually driven back from the market and replaced by better dyes. These competitors were mostly derivatives of the Aminonaphthol-mono-sulphonic acid 2.5.7 (J-acid), and it was surprising how many combinations had been discovered. J-acid had been transformed into ureas, thiazoles, benzoyl derivatives, azimides and benzylidene compounds. These derivatives were transformed in azo compounds which were on the market under many names, such as rosanthrene, benzo-fast red, Zambesi red, diazo-fast red, &c., and it remained to be seen which of the hundreds of combinations would remain victorious.

Alizarine and Indigo

The fight between alizarine and its competitors was repeated between indigo and newcomers. Indigo was no longer the absolute king, but was being pushed back slowly and steadily. Again J-acid lent itself to the production of very fast blue and violet polyazo dyes. The old and bad benzidine and dianisidine dyes were being replaced by these very fast colours which, on cotton, were better than even indigo. Hydroneblue, indanthrene, anthraceneblue and alizarinesaphirole were competitors of great importance, and the complex chromium and coppersalts of di-hydroxyazo dyes were threatening indigo as a wool dye. Indigo was still the greatest product, China absorbing alone about £2,000,000 per annum, but it seemed safe to predict that it had passed its zenith and would remain stationary like alizarine.

The discovery of artificial indigo had given rise to new and quite unexpected intermediaries. Substances such as chloranil and diketo-dihydro-thionaphthene-dimethylamino-anilide were being proposed as new intermediaries, and the anilide of arylamino-naphthoquinone was condensed with oxythionaphthene, giving rise to vat dyes similar to Friedlander's thioindigo.

Vat Dyes

Vat dyes in general had undergone such a change as would have been believed impossible 20 years ago, and anthraquinone seemed inexhaustible in this respect, although many of the new dyes were not so excellent as one might expect at first. But not only were alizarine and indigo threatened; practically every colouring matter was open to attack; there was a perpetual fight and no end to be seen. Changes were slower than before, but steady and unavoidable.

If every dyeworks had its Green, Sandmeyer or Perkin, if every dyeworks had its new pyrazolone, tetrahydronaphthylamine or diaminobenzophenone, the slow change just indicated would be accelerated and in 50 years the very complicated compounds would be quite common. All this, however, did not eliminate the fact that to-day we had an over-production of at least 200 per cent. This over-production, although very strongly accentuated to-day, had been felt long ago. Many products of excellent quality could be sold only at an actual loss and with great difficulty. Therefore, it was not surprising that for many years past dyeworks underwent a steady change because they tried to find new fields of activity.

A Broader Basis

Several branches of technology had helped to put dyestuffs chemistry on a broader basis. These were pharmaceutical chemistry, photographic chemistry, tanning chemistry and technical colloids, such as celluloid, acetylcellulose, artificial leather, artificial horn Bakelite, and lastly, heavy chemicals, nitric acid, sulphuric acid, acetic acid, ammonia, &c. The large continental firms had all without any exception directly or indirectly taken this course of development.

Many of the intermediaries of dyes could readily be transformed into valuable pharmaceuticals. Phenacetine antipyrene, salvarsan, &c., would be impossible had not the experience gained on the dyestuff field helped the research chemist. But here also the old substances were being gradually replaced. But relations between dyestuff chemistry were much closer. Not only were intermediaries useful, but very often dyes themselves could be used advantageously. It was quite 35 years ago that crystal violet was recommended under the name of pyoctannin as a powerful disinfectant, without great success. New compounds had now been recently discovered. It was found that the silver-salts of many acridin dyes were very powerful disinfectants, being at the same time practically non-poisonous. These dyes were used as a rule on leather with titanium-mordant, and this new discovery might lead to the replacement of the poisonous phenol and cresol preparations, some of which were nevertheless first-class pharmaceuticals. Certain aminobenzoyl derivatives of H-acid and similar amino-oxynaphthalene derivatives were not only valuable intermediaries but also very strong poisons for blood parasites, and it might be that they would replace salvarsan. Pyrazolones were to-day equally important for antipyretics and new colours of the tatezene series.

Relation between Dyes and Photography

Very similar relations existed between dyes and photography. *p*-aminophenol was important for the production of sulphur dyes and a good photographic developer. Progress in dyestuffs had revolutionised the production of many photographic chemicals. The large production of plates and films was brought to perfection, especially in the great dye works on the continent, and the manufacture of acetylcellulose was dependent upon the large quantities of chlorine which were obtained by the electrolysis of sodium and potassium chloride. Acetylchloride was made by the interaction of sulphur chloride, chlorsulphonic acid and sodium acetate. Camphor was partly replaced by acetyl-arylamines. Acetylcellulose was certainly a very interesting substance with regard to cinemas, but was not of much importance as a competitor of viscose.

But even by starting pharmaceuticals and photographic chemicals and celluloid, &c., the large dye works had not enough to do and had still to find new and profitable fields of activity. The tanning industry offered a new outlet since it was found that naphthols and phenols, by the action of formaldehyde and sulphuric acid, could be transformed into valuable tanning substances which were actually used in large quantities. Bakelite and artificial substitutes for shellac were new and important substances and the chief problem associated with this manufacture was the production of formaldehyde from coal.

Expansion of Manufacturing Activities

The expansion of dye works was, perhaps, the most remarkable phenomena on the whole field of technology, and it was safe to say that the value of non-dyestuffs in these works was much greater already than the dyestuffs, and would increase in proportion. Heavy chemicals such as ammonia and nitric acid, chlorine and caustic alkali, even sodium and cyanide, had a greater value in output than all the dyestuffs used in the world.

This rearrangement had necessitated certain amalgamations which rendered continental dye-concerns very strong, not on account of their capital, which was actually small, but on account of their co-operation and their great experience. This co-operation was possible because the men who were directing the business had all grown up with their plant, and were scarcely influenced by financial promoters from the outside. These amalgamations had not created any boom on the stock exchange, no shares were cut in tenths and pushed up to 100 per cent. again. Dyestuff chemistry was no affair of the financiers but involved serious hard work. It was, of course, very easy to manufacture any product on a very large scale, but the question was not to manufacture, but to sell. He had seen plants which could easily provide the whole world with H-acid, naphthol or aniline; but they were shut, because nobody wanted such things. Steady and serious development seemed to him the fundamental condition of every sound dyestuff industry.

Professor MORGAN, in proposing a vote of thanks to Professor Fiertz, said it was a matter for consideration how it came about that a distinguished Swiss chemist should come to this country and teach us the business of making dyes, because there was not an ounce of coal in Switzerland. Notwithstanding this, Switzerland had succeeded in building up a dye industry which compared very favourably with the large dye industry of Germany. He could not help feeling that the chemical industry in this country had come into prominence during the past few years in a manner that was somewhat to its discredit. Before the war, there were only two countries in which chemistry was properly appreciated, viz., military Germany and peaceful Switzerland. If we were to set up a dye industry at all commensurate with the importance of

the British Empire, we should have to work much harder than we had done in the past. The dye industry was essential to all other chemical industry. Without the trained dye chemists Germany would not have succeeded as she had done in the utilisation of atmospheric nitrogen, and without a chemical industry he gave the British Empire a life of 30 years.

The Structure of Molecules

Following the paper on dyes by Prof. Fiertz, there was a joint discussion in Section A (Mathematical and Physical Science) on "The Structure of Molecules," which was opened by Dr. Irving Langmuir, of the United States.

Dr. LANGMUIR said that they were all agreed upon certain fundamental details with regard to the structure of the atom. For instance, they were all agreed that the atom had a nucleus which was positively charged and had an integral number of units of positive electricity on the nucleus. Surrounding the nucleus in the neutral atom were a sufficient number of electrons to neutralise the charge or to be equivalent to the charge on the nucleus. Different atoms differed from one another in the magnitude of the charge on the nucleus. The first element in the periodic table, hydrogen, had one nuclear charge and that nucleus was capable of binding or holding one electron. The next element in the periodic table, helium, had two charges, and so on, and going right through the periodic table there were atomic numbers which represented not only the charge on the nucleus, but also the number of electrons arranged around the nucleus in some sort of stable configuration. This much there was agreement upon, but when it came to what these electrons were doing, or how they were arranged in space, there was great disagreement. From some lines of evidence certain things were known very definitely, but from other lines of evidence the contrary was almost as definitely known.

There was beautiful evidence from the spectrum that atoms were moving in the circular orbit, or the elliptical orbit, surrounding the nucleus; on the other hand, the chemical evidence seemed to incline to the view that there must be positions of equilibrium of the electrons and that the electrons were moving within certain circumscribed regions. That conflict was not an essential one except where they wished to bridge over between the two. For the chemical evidence it was not necessary to know whether the electrons were moving or not. The geometry of the atom could be dealt with without regard to the question of motion.

The important thing from the chemical point of view was the number of electrons that existed in different layers of electrons, and the number that were held in common between two atoms. That was important, but as to what the mechanism actually was by which they were held in common, or whether they were rotating or not, was, from the chemical point of view, of very little importance, but, from the spectrum point of view, it was an essential part of the problem.

The Chemical Aspect

He wished now to deal with one aspect of the problem of molecular structure purely chemically, and that was, what was it needed to assume in regard to the structure of the atom in order to derive from these assumptions all the theories of valence that had been so successful in chemistry. The theories of valence in chemistry summarised practically all our knowledge of chemical structure. The chemist ever since the first days of chemistry, or certainly within the last half-century, had devoted himself in the theoretical line to this almost more than to any other point. He had dealt with the structure of molecules; he had wanted to know not only what atoms were contained in molecules or chemical substances, but how they were related to one another and how they were arranged in space.

Stereo-chemistry had been a very important field of chemistry, but that dealt with the geometrical arrangement of the atoms with respect to one another. The linking of atoms to one another, what atoms lay adjacent to one another, and in what way they were combined with one another had been the essential and main problem of chemistry. The accumulated knowledge of the chemist was largely summarised in theories of valences, and if we could derive these same laws of valence for the larger part of the field of chemistry, then we could reason back and conclude that the assumptions that were made, or their equivalent, must correspond to the truth.

Recently, based upon the discovery of the electron and the theory of the nuclear atom, these theories of valence had developed until they now offered more powerful methods of attack on the problem of molecular structure than any of the standard chemical methods. The greatest progress was to be made by correlating both methods. The valency theories had dealt with the geometrical arrangement of atoms in molecules. We now began to know something of the arrangement of the electrons in the molecules and to realise that this new knowledge must profoundly affect our interpretation of chemical phenomena.

From the spectrum point of view, hydrogen was the only element upon which there was agreement. Already with helium there were difficulties. The chemical question, on the other hand, was very much more simple because it gave a qualitative theory which gave a kind of picture of the conditions which must be gained with every theory before it was possible to develop it further.

Some Assumptions

The first postulate or assumption he proposed to make was (1): "The electrons in atoms tend to surround the nucleus in successive layers containing 2, 8, 8, 18, 18 and 32 electrons respectively."

We did not know the cause of that, and he did not believe anyone had made a really good guess as to what the cause was. We knew that these numbers were proportional to 1, 4, 9 and 16, which were the squares of 1, 2, 3 and 4, but we still needed an explanation.

He then made a second postulate (2): "Two atoms may be coupled together by one or more duplets held in common by the completed sheaths of the atoms." This assumption needed some definitions. If we had an atom having a nucleus with a charge of 1, *e.g.*, 1 hydrogen atom, then the first postulate would not apply unless two hydrogen atoms could be got together. The second atom, helium, however, completely satisfied postulate 1. The same applied to lithium, the third element of the periodic table. There would be one electron left over in the case of lithium, and from that mere fact alone it could readily be seen that lithium should have a valence of 1. In this way it was possible to get a picture of the properties of lithium and of the compounds of lithium from the mere fact that two electrons were held together, and the one that was left over was loosely held in comparison. In most of the atoms there were a certain number of electrons left over which he called the sheath, and as the number of electrons increased so there were succeeding layers outside the bond holding two electrons, as laid down in postulate 1. The pairs of electrons held together he called duplets, and the configuration of 8 atoms in the sheaths he called octets, and in endeavouring to apply this theory quantitatively in order to develop the theory of valence he had taken *Ve* as the electrovalence, and *Vc* as the covalence, the former representing the kernel charge or number of electrons in the outside shell, and the latter the force holding the pair of electrons in the centre. Working this out it was shown how the sum of the electrovalences and the covalences were equal to *O*, which satisfied postulate 1, and led automatically to an explanation of the valence theory.

Valence Rules

If the first two postulates were supplemented by a third one, the usefulness of the theory was greatly added to. That third postulate was (3): "The residual charge on each atom and on each group of atoms tends to a minimum." The justification for this was that it was known from the work of Rutherford and others that there is a positive and a negative charge which created a repulsive force between the molecules. Whether it was a centrifugal force or a static force made no difference as far as a recognition of the fact of the existence of a repulsive force was concerned which held the positive and negative particles apart in some way. It was in view of our ignorance of the position that he adopted assumption No. 3. He agreed that No. 3 very often conflicted with No. 1, and it was the interaction between these two that he believed was the governing factor in chemical combination. There were plenty of cases in which No. 1 did not hold because of No. 3, and there were plenty of cases in which No. 3 did not hold because of No. 1.

From these three postulates it was possible to deduce not only the valence rules of organic chemistry, but the exceptions to those rules and the ordinary rules of inorganic chemistry.

For that reason he claimed that these postulates must correspond to the truth. There still remained the fundamental question of whether these electrons were moving or stationary. That was a matter which would have to be discussed, and he had no doubt it would be discussed for a good many years. Personally he was absolutely convinced that these electrons rotated, and he would not care to speculate on what would happen if they were stationary.

Discussion

A short discussion followed, which was taken part in by Prof. Smithells, who exhibited models illustrating Dr. Langmuir's theory; Prof. W. L. Bragg, who said that a study of the crystal structure of atoms tended to confirm Dr. Langmuir's views, although he did not agree there was an outer layer of 8 electrons; Prof. Partington, Prof. Arrhenius, Prof. Rankine, Prof. S. H. C. Brigg, Dr. Eric Rideal and Sir Oliver Lodge also took part, but none of the speakers seriously challenged Dr. Langmuir's theory.

Biochemistry

Opening a joint discussion on Biochemistry of Section B (Chemistry) and I (Physiology) on Monday, Professor W. Gowland Hopkins, F.R.S., said that for biochemists this occasion was one of happy augury. This year's meeting of the British Association would be marked not alone for this coming together of Sections B and I, but also by the circumstances that they met after listening to Presidential Addresses in which the importance of chemical studies of the plant and animal had been so fully emphasised and so ably illustrated. He confessed to having found some difficulty in deciding what was likely to be the most profitable line for the discussion to take. It was thought by some members that it would be justifiable to use the occasion entirely for putting the merits and the claims of biochemistry before the members of Section B. Others thought that if propaganda were placed alone before the meeting the discussion might soon find itself in the air, and held that some definite chemical phencmena, capable of being viewed from the standpoint of either section, would form the best basis of discussion. He therefore ventured on a compromise between these two policies, He suggested that they should discuss certain definite chemical happenings, but he proposed to use the facts as a text illustrating the present position and the claims of biochemistry.

One often found that organic chemists were apt to think that the determination of the constitution of biochemical products and their synthetic production in the laboratory covered most of the ground of biochemistry. It was, he thought, important to point out that if this were so there would be no justification for giving a special position and title to the science. The task of biochemistry as a distinct branch of Science was to study dynamic events in the living body; to follow reactions which proceeded in living tissues and to discover their course and stages; ultimately it must endeavour to envisage as a whole that remarkable organisation of reaction which underlies the equilibrium in that complex chemical system—the living cell.

Professor Hopkins then discussed certain aspects of physiological oxidations; in particular the oxidation which liberated energy from the foodstuffs.

Considering first the oxidation of fatty acid in the body, he said that the prominent aspect of this was the occurrence of β-oxidation. The straight chain aliphatic acids were so dealt with that each stage of the oxidation involved the removal of the carbon atoms in pairs. The evidence relied upon in proof of this was very familiar to the biochemist, but he did not remember an occasion when it had been publicly submitted to the criticism of organic chemists.

Suggestive evidence was first supplied by Knoop and most direct evidence was obtained by Embden, who showed that all fatty acids with an even number of carbon atoms passed in metabolism through the 4-carbon stage, whereas those with an uneven number wholly failed to do so. This factor offered the strongest suggestion that the carbon atoms were removed in pairs. Embden's experiments illustrated another method of bringing intermediate products to light. The activity of a single organ was employed instead of that of the body as a whole. In such a case there was often arrrest at one particular stage in a series which the body as a whole completed. When perfused through a surviving liver the members of the even series of fatty acids yielded acato-acetic acid, which those of of the uneven series did not. There was a good deal of further evidence in favour of β-oxidation which he could not discuss at the moment. Behind it all stood the suggestive circumstance that in the fat stores of animals and plants only fatty acid of the even series were found.

What, at one time, stood in the way of the acceptance of the evidence was the lack of chemical analogies. This objection was now removed, for Fischer and Schneider (as well as others) had shown that the fatty acids produced by the oxidation of paraffin, with atmospheric oxygen under pressure, consisted of alternate members of the series, the intermediate members being absent. On the whole, moderate temperatures seem to favour β- and high temperatures α- oxidation. The difficulty from the biochemical side was found in connexion with the precise fate of the 2-carbon groups which were removed at each stage. It was natural to think of acetic acid as the substance to be followed up, but this assumption involved difficulties which he must ignore, but which he hoped would be discussed by others.

The equilibrium relations between carbohydrate and lactic acid exhibited some striking aspects. There we could study during the survival-life of the tissue after its removal from the body; for in the case of muscle we could easily test its condition from time to time, and its "survival" existence could be shown to retain for considerable periods characters which were essentially physiological. If an exercised muscle be supplied with oxygen it respired and its store of glycogen was slowly depleted, but no lactic acid accumulated within it. The moment it was deprived of oxygen, however, lactic acid began to accumulate and continued to do so at a steady rate. If a muscle which had so accumulated lactic acid were replaced in oxygen the acid disappeared, and one would suppose it was then all oxidised. The striking fact, however, was that it was not. Only about one quarter was so oxidised, the remainder being reconverted into glycogen. The conversion of glycogen into Hl, while a continuous process in the absence of O_2, was reversed and a new equilibrium was being established in the presence of O_2. When a full understanding was available of the factors concerned in directing these events it would certainly be full of chemical interest.

These facts, aided by the thermodynamic studies of A. V. Hill and others, had justified physiologists in taking a particular view as to the relations between the chemical change which occurs in active muscles and its physiological functions. The mechanical act of contraction was associated not with oxidation but with the conversion of sugar—derived from glycogen—into Hl. The liberation of free energy depended only partly on chemical change; it was largely due to a change in the muscle fibres which was physical. Because Hl was in some way concerned *qua* acid in the initiation of the physical change, for which some particular concentration of hydrogenions seemed to be necessary, it was at the moment of contraction produced, so to speak, in excess. But there followed upon each contraction a period of recovery during which O_2 played its part. The Hl was partly oxidised and partly reconverted into the glycogen which gave it origin.

Oxidation of the Amino Acids

Turning to the oxidation of the amino acids derived from protein, Professor Hopkins said it was in this connexion perhaps that the chief successes of modern work upon intermediary metabolism had been won, but the subject was so large that his reference to it must be slight. It should be remembered that it was the free amino acids and not polypepside materials that underwent oxidation. Each had its own special line of change determined by its own special structure. No little ingenuity and acumen had been expended in the search for evidence as to the intermediate products and the precise lines of change.

Professor Hopkins then referred to what was known concerning the mechanism which induces oxidation in living tissues. Biochemistry had always had to face a fundamental problem. The tissues received from the blood a supply of molecular oxygen; but upon materials which the tissues continuously oxidised each molecular oxygen had, at the temperature of the body, no action. How then were the oxidations induced? Several theories had been advanced, but he would refer alone to facts which possessed experimental support.

Whether its importance be general or limited, one circumstance must always be considered when the problem of bio-

logical oxidations was before the mind. Active living cells contained, always in very small concentration, a supply of antoxidisable material. Experiment and theory alike indicated that antoxidation at low temperature involved a preliminary uptake of oxygen in the peroxide form. Once this peroxide had formed its subsequent fate would depend upon circumstances.

The Dynamic Side

In illustration of the fact that an analytical study of the tissues themselves could assist—and might still more assist in the future—our attempts to obtain knowledge of the dynamic side of biochemistry, Prof. Hopkins mentioned that he had recently separated from various tissues a substance which played a clear part in hydrogen transport within its cell. The substance which he had called glutathione, was, it would seem, present in all living active tissues. It was when in a reduced form a dipeptide containing glutamic acid, and cystein, or when in an oxidised form, a doubled molecule of such a dipeptide—the SH group of the cystein moiety yielding the disulphide group—S-S, which linked the two molecules together. The substance when in the reduced form was antoxidisible at such H-ion concentrations as existed in the tissues, and during its spontaneous oxidation the production of hydrogen peroxide could be detected. But its sulphur groups could also act either as hydrogen-donators or hydrogen-acceptors according to circumstances. It could be in this sense either reduced or oxidised by factors actually present in the tissues. Its properties depended upon its sulphur groupings, and only these need be considered.

Practically all the classical dealings with molecular architecture employed by the chemist in his analytical and synthetic studies were hydrolysis and condensation and were processes in which it was specially adept. Oxidation and reduction on manifold lines quite distinct from those with which he had been dealing were fully within its power. It could perform halogen substitution. It could acetylate and methylate. It performed many syntheses not yet attempted by chemists. It could close rings or open them, though in this latter connexion it displayed failures which were as interesting as its successes, for they illustrated the specificity of its catalysts.

Study of Metabolism

The whole subject of metabolism called continuously for the thought of those who were accustomed to think in terms of molecular structure. Its study indeed was reaching a stage when only those so qualified could hope to advance it greatly. It was a pity that as a study it had in this country attracted so few, especially of those whose primary training has been chemical. It would be idle to deny that for a couple of generations the trained British chemist in his scientific work and thought almost neglected the animal and thought of the plant mainly as a source of alkaloids and other compounds on which to exercise his synthetic ingenuity. He had scarcely thought about the dynamic events in the organism itself. He ventured to express the belief that in their own interests, as well as in those of other people, organic chemists should turn their thoughts towards the chemistry of the living cell, even when their personal activities must be otherwise centred.

Chemistry of the Living Cell

Complete grasp of any given set of phenomena could only be attained when they were studied under all the conditions in which they were known to occur. We had seen that organic re-action which proceeded in the body did not differ in kind from those which were induced in the laboratory. It was the conditions under which they occurred which differed so greatly. In the individual living cell, a laboratory so small that the total number of molecules it contained at any moment could probably be expressed in figures which the mind could easily grasp, a great number of re-actions, independent, consecutive or complete duly proceeded in nearly neutral solution and at a mean temperature of 39°C. But what especially stamped the cell as a chemical system was the remarkable systematised development of catalysis within it, and the organisation of its reactions into a dynamic unit. The specificity of the catalyst was doubtless one of the factors which secured the organisation. What were these catalysts, and how did they arise from the material of the cell? These were difficult questions; but, no less than the reactions themselves, they were surely material for the thought of the chemist. Since they referred to the organic chemistry of Nature they should indeed be at the very centre of his thought. When the chemist had opened this chapter of science a new chemical romance would have begun. Until this chapter was well written, chemical science, in spite of its vast triumphs, would not have come fully into its kingdom. While the pages remained blank the chemist did not, in the fullest sense, know chemistry.

Discussion

Dr. C. Lovatt Evans said there was a point in regard to the subsequent fate of the two carbon atoms that were renewed in the course of the oxidation of fatty acids. It would be interesting to know Prof. Hopkins' views with regard to some work recently done on the presence of acetaldehyde in the tissues. Again, did Prof. Hopkins think there was any evidence at all of peroxide systems proper in animal tissue? He had looked through the literature, and had not been able to find any such evidence in the case of animal tissue, but with plant tissues he thought it was possible. The wonderful polypeptide that Prof. Hopkins had discovered had cleared up what had been a mystery in regard to physiological oxidation for many years. During the war he himself had been brought into contact with the action of hydrocyanic acid as a poison gas. This could be breathed with impunity up to a certain concentration in the air, but beyond that point it was very rapidly fatal. Apparently the reason why hydrocyanic acid could be breathed in this way was because it was detoxified in the body by conversion into something else, and that something else was thiocyanate. There might possibly be some connexion between that detoxification by conversion into thiocyanate, and the function of the hydro-sulphide groups that had been identified in animal tissue. With regard to the metabolism of sulphur in the body, that was an obscure subject, and it was to be hoped that this discovery of Prof. Hopkins would make it clear.

Professor HILL referred to experiments dealing with the subject of living tissue from the thermal aspect, by which the liberation of acid from a muscle can be calculated from the amount of heat. The thermal method of investigation had the great advantage that the muscle was not injured.

Dr. M. O. FORSTER, in closing the discussion, said the real trouble was that the organic chemist had so much to do. He had to earn his living, among other things, and he had not added to his chemistry a practical working knowledge of the tissues. That was really the trouble, and why they stayed at the organic stage, the mere silk-worm stage, and never arrived at the beautiful moth or butterfly, stage of the biochemist. Organic chemists were very limited persons. They could work in test tubes, and flasks and beakers, and recognised materials which the human and other living systems produced. He, at his mature age, could never hope to become a biochemist, but what was to be hoped for as the outcome of this discussion was the direction into biochemical channels of the efforts of some of the adherents of the chemical profession. After all, they had the future before them, and the opportunity they had before them was a very special one. It was necessary that they should have added to the technique of the organic chemist a knowledge of the technique of tissue work, either vegetable or animal. A biochemist was the man or woman who could recognise the chemical changes actually progressing in living tissue. The two techniques were wanted, and therefore he hoped that some of the younger members of the profession would take the opportunity they had of looking forward to a very happy and useful career in this subject.

Professor HOPKINS, replying to the discussion, said he had found that the cyanides had very little effect upon the hydrogen transferred, but until further work was done it would be impossible to say why the body protected itself in the manner mentioned by Dr. Lovatt Evans. In the case of animal tissue there was no direct evidence of peroxide formation, but it was perfectly certain that it existed in plants. He joined with the President in expressing the hope that the younger—and not necessarily only the younger—organic chemists would take up biochemistry, so that the physiologists would get more help from their work. He felt justified in saying that if the younger men did wish to look forward to a career in biochemistry, now was the very moment for them to take it up, because at present there was no supply of such chemists at all.

[The remainder of the proceedings will appear next week.]

Machinery at Olympia

Engineering and Chemical Exhibits Reviewed

THE Shipping, Engineering and Machinery Exhibition, which opened on September 7, and which will close on September 28, in addition to the exhibits has an interesting programme of lectures during that period. On Monday the Institute of Metals and the Institution of Sanitary Engineers visited the exhibition and took part in a discussion on "The Corrosion of Non-Ferrous Metals," opened by Dr. G. D. Bengough. On Wednesday the subjects discussed were "The Application of Oil for Power Purposes," by S. H. North; and "Nomenclature and Specification of Oils for Power Purposes," by J. Venn-Stevens. On September 22 a lecture on "The Physical Properties of Clay in Connexion with Engineering Works" will be given by A. S. E. Ackermann; and on September 26 Engineer-Commander F. T. Addyman will lecture on the "Comparative Costs of Oil and Coal."

In the exhibition proper there are quite a large number of stands of interest to the chemist or chemical engineer. Several firms are showing acetylene-welding and metal-cutting apparatus, among these being Allen-Liversidge, Ltd., of 106, Victoria Street, S.W.1; Carbic, Ltd., of 51, Holborn Viaduct, E.C.1; the Thorn & Hoddle Acetylene Co., Ltd., of 151, Victoria Street, S.W.1; and the Davis-Bournonville Co., of Jersey City, U.S.A. Alloy Welding Processes, Ltd., of 14-16, Cockspur Street, S.W.1, make a speciality of electric arc welding plant and show three new types of equipment. The company also show electrodes of all types of their own manufacture.

Valves for all purposes constructed on a new principle under "Clayton's" patent are exhibited for the first time at the stand of the Clayton Valve Co., Ltd., of Preston Old Road, Marton, Blackpool. Among the exhibits are patent stop valves for air, oil, gas, &c., and a new 2-in. patent blow-off valve, having a safety-key locking device, a floating valve head, and protected and rustless-steel working parts. Cuirass Products, Ltd., of 69, Victoria Street, S.W.1, display their anti-corrosive, waterproofing and insulating paints, and William Little & Sons, Ltd., of Springburn, Glasgow, show at their several stands light-railway material, including wagons for use on rubber and sugar estates.

Boilers, superheaters, tanks, &c., are shown and illustrated on the stand of H. & T. Danks (Netherton), Ltd., of Netherton, Dudley.

A new instrument for indicating the oxidation effects in furnaces and known as the "Oxyscope" is a feature in the exhibit of James Pitkin & Co., Ltd., of 28, Hatton Garden, E.C. They also show dial micrometers of a new pattern for paper and rubber mills in addition to oil level indicators, vacuum and pressure gauges, salinometers and other specific gravity instruments. Demonstrations of electric arc welding are given by the Premier Electric Welding Co., Ltd., of Bank Buildings, St. James's Street, S.W.1, who also show samples of the latest types of "Premier" electrodes.

"Brinell" hardness testers and calibration levers and an "Izod" impact tester are among the features of the display of W. & T. Avery, Ltd., of Soho Foundry, Birmingham. The Lea patent coal meter which has been specially designed for the measurement of coal as it is burned is shown fitted to a working model of a Babcock-Wilcox chain grate stoker at the stand of the Lea Recorder Co., Ltd., of 28, Deansgate, Manchester, who also show their boiler-feed water measuring apparatus.

A complete plant consisting of an air washer, a cased centrifugal fan, electric motor, and ozone plant, capable of dealing with about 6,000 cubic ft. of cleaned ozonised air per minute, is shown in continuous operation at the stand of Ozonair, Ltd., of 96, Victoria Street, S.W.1. A complete range of portable Ozonair apparatus for laboratories, &c., is also exhibited.

The London Electric Firm, of Brighton Road, Croydon, are showing in use on their stand one of a range of flexible couplings, for which a provisional patent has been granted, in which laminated metal links are used to connect the flanges, no perishable material being employed. It is said to be specially suitable for coupling dynamos and motors, reduction gears, pumps, blowers, hoists, &c., and is made in a comprehensive range of sizes. Recording instruments for marine and land use in a number of types and sizes are a feature of the exhibit of Evershed & Vignoles, Ltd., of Acton Lane Works, Chiswick, W.4. The "Dionic" water tester for determining the amount of any inorganic impurity dissolved in water, without the use of chemicals or apparatus requiring expert operators, has previously been referred to in THE CHEMICAL AGE. They also show their meggers, bridge-meggers, ducters and ohmmeters for the measurement of electrical resistances of all degrees of value.

Anti-rust and anti-corrosion preparations, manufactured by Sozol, Ltd., of 20, Copthall Avenue, London, E.C.2, are attracting considerable attention. "Sozol" is a liquid preparation in various consistencies, which, it is claimed, can be relied upon as an absolutely certain preventative against rust and corrosion under the worst conditions. It is stated that actual immersion of an article in acid for some minutes fails to destroy the thin transparent film of "Sozol." The sole sales agents for the British Isles are F. Simmonds & Co., of 1-3, Regent Street, London, S.W.1.

A feature of the stand of the Victory Pipe Joint Co., Ltd., of 28, Victoria Street, S.W.1, is a full-sized model of a short length of 24 in. pipe line, fitted with "Victaulic" "A" type joints between each pipe length (short lengths of pipe are shown, owing to lack of space), representing a section of a hillside pipe line of a hydro-electric installation, and showing the manner in which each individual pipe length is anchored. There is a gap of ¼ in. between each pipe length, any increase of length owing to rise of temperature therefore affects only each individual length, and has no effect upon the line as a whole. The lowest joint is arranged so that sections can be withdrawn to display the "Victaulic" leak-proof ring, and to show clearly the manner in which this ring performs its purpose—viz., that of maintaining a completely leak-proof joint whilst permitting any degree of expansion, and in addition providing considerable flexibility.

Water-softening plant is shown by the Kennicott Water Softener Co., of Ettingshall, Wolverhampton; while John Thompson (Wolverhampton), Ltd., also of Ettingshall, include a homogeneously lead-lined wrought-steel vessel for chemical works, and a pressed steel weldless annealing pot, in the exhibit.

The Cambridge & Paul Instrument Co., Ltd., of 45, Grosvenor Place, S.W.1, show a representative collection of instruments, including electrical CO_2 indicators and recorders, pressure gauges, resistances, thermo-electric and radiation and optical pyrometers, oil flow indicators, and the Rosenbain fuel calorimeter. The "Tompkins" patent steam dryer and separator, which forms the exhibit of Ward & Crichton, of 41, Chapel Walks, South Castle Street, Liverpool, is an appliance for removing the moisture from steam by mechanical means—a combination of centrifugal action and the tangential discharge. It is, the makers state, applicable for any pressure, its action depending solely on the velocity of the steam passing through it. Besides steam, the appliance is said to be suitable for removing moisture from air or any other gas containing moisture.

Graphite pipe joint compounds, elastic cement, &c., are included in the stand of Major, Robinson & Co., Ltd., of Scols Works, Sykes Street, Hulme, Manchester, while Thos. Ash & Co., Ltd., of Berkley Street, Birmingham, make a good show of extractors, ventilators, fans, &c. The "Atlas" boiler water regulator, a compact and portable apparatus, which, it is claimed, enables an engineer to test his boiler water in a few minutes, and, without any chemical knowledge whatever, allows him to determine with precision the quantity of any given reagent which should be used to counteract the scale-forming and corrosive properties of the feed water, is one of the features of the exhibit of the Atlas Preservative Co., Ltd., of Deptford, London, S.E. 8. They also show "Atlas E." boiler preservative, and the "Atlas Ruskilla" iron and steel paint.

Technical advice on points relating to fuel economy is offered at the stand of W. R. Patents, Ltd., of 17, Greek Street, Leeds, who are again showing the CO_2 indicators.

One of the many interesting features at the stand of Wailes Dove Bitumastic, Ltd., of 5, St. Nicholas Buildings, Newcastle-in-Tyne, is a model factory showing how such erections can effectively be protected from corrosion by "Bitumastic" solution.

The Millwall Engineering Co., Ltd., of 21, Panton Street, S.W.1, manufacturers of heating coils and all classes of pipeware for oil-burning installations, show some excellent examples of tube-bending and coil work. The coils shown include coils for refrigerating, condensing, steam-heating and oil-firing apparatus.

Hand and power liquid elevators are shown by Boulton & Paul, Ltd., of Riverside Works, Norwich, while pressure gauges, steel-tube mercury thermometers, &c., are seen at the stand of the Budenberg Gauge Co., Ltd., of Broadheath, near Manchester. A steam-turbine centrifugal and fat and grease extractor is shown in operation at the stand of Industrial Waste Eliminators, Ltd., of 20, High Holborn, W.C.1, in addition to models of the "Iwel" degreasing, fish-waste utilisation and other machines.

The exhibit of the Anglo-American Oil Co., Ltd., of 36, Queen Anne's Gate, S.W.1, comprises a wide range of oil-burning systems, all of which have been found by the company to be economical in use. The Anglo-Mexican Petroleum Co., Ltd., of 16, Finsbury Circus, E.C.2, show specimens of their fuel, Diesel and gas oils, and the British Petroleum Co., Ltd., of 22, Fenchurch Street, E.C.3, show their "B.P." fuel and power oils, together with other exhibits of petroleum products.

"Electro-Automate," lamp specialities which do not need batteries or refills and consist of dynamos with permanent magnets based upon new methods, eliminating contact screws, carbon brushes, &c., are seen at the stand of Theo & Co., of 6 and 6A, Hatton Garden, and 13 and 17, Johnson Street, Liverpool.

August Trade Returns

A Further Slight Improvement in Exports

WHILE the period of trade depression through which we have been passing cannot yet be regarded as a thing of the past, there are at least indications in the Board of Trade returns for August which give ground for the hope that the industry of this country is beginning to "turn the corner." Even allowing for the fall in values the totals when compared with the corresponding month of 1920 disclose a huge leeway to be made up, but as against July of this year the returns give some cause for satisfaction.

Imports during the month have risen by £7,823,866, and the exports are £8,810,131 above those of July, which latter showed an increase of £5,020,161 on June. Re-exports also show an improvement of £636,223, and their total of £9,997,779 is the highest reached in this class during the current year. Comparison with the August figures for 1913 and 1920 shows the position as follows :—

	1913.	1920.	1921
Imports ...	£55,975,704	£153,343,305	£88,581,040
Exports ...	44,111,174	114,903,335	51,346,307
Re-exports ...	8,150,054	13,368,347	9,997,779

Of the £8,000,000 increase in exports for the month, the fuller resumption of coal exports accounts for no less than £4,110,945, the August figure being £5,668,594, against £1,559,649 in July.

The adverse balance on August trade of £27,536,954 shows only a slight improvement on the July figure of £28,223,219. Taking the first eight months of 1921, our exports total only £532,458,757, against imports of £740,881,573, leaving a deficit of £208,422,816. When our diminished "invisible" exports are taken into consideration the gravity of the position becomes clear and the need for increased efforts to recapture foreign markets is emphasised.

Dyes and Dyestuffs

The detailed figures showing imports of dyes and dyestuffs during the month indicate a large increasse in the import of alizarine, the amount being 4,162 cwt., as against 33 cwt. in July. No synthetic indigo was imported as compared with 15 cwt. in the former period, but other coal-tar dyestuffs amouuted to 1,365 cwt. as against 383 cwt. Cutch at 2,100 cwt. shows an increase over 100 cwt., and ground barytes an increase of nearly 800 cwt. White lead (basic carbonate) is down from 7,884 cwt. to 2,705.

Turning to the exports, of which no detailed figures are given, coal-tar products are up to 4,098 cwt., as against 2,511 in July, 3,568 in June, and 4,018 in May; and dyestuffs and other sorts stand at 5,637 cwt., as against 4,058, 3,645 and 2,989 respectively. The total quantity of dyestuffs of all sorts exported during August, therefore, amounted to 9,735 cwt. an increase of 3,166 cwt. on the previous month. Of barytes, 200 cwt. were exported during August, as against 804 in July, white lead 10,916 cwt., as against 10,952, and white lead, other sorts, 61,957 cwt., as against 57,937. The total quantity exported under dyes and dyestuffs and painters' colours and materials amounted to 73,073 cwt., or 3,380 cwt. more than in the previous month. The total value under this heading was £201,507, an increase of £8,258 on the July figures.

Chemicals and Drugs

As far as bulk quantities are concerned the month's imports of chemicals and drugs show an increase of approximately 1,000 tons. Detailed figures of imports showing an increase over last month's figures are given below, with the July figures in parentheses : Acetic acid (including acetic anhydride), 180 tons (105) ; bleaching materials, 2,491 cwt. (972) ; borax, 1,645 cwt. (692) ; calcium carbide, 38,663 cwt. (17,932) ; distilled glycerine, 190 cwt. (129) ; red lead, 2,218 cwt. (405) ; sodium compounds other than nitrate, 11,722 cwt. (9,667) ; and zinc oxide, 509 tons (350). The decreases, similarly compared, are : Tartaric acid (including tartrates not elsewhere specified), 2,463 cwt. (2,912) ; crude glycerine, 1,004 cwt. (1,662) ; nickel oxide, 2,080 cwt. (2,086) ; sodium nitrate, 19,197 cwt. (23,130) ; and cream of tartar, 3,454 cwt. (4,095).

Recovery in Sodium Compounds

Considerable improvement is noticeable in the export of certain articles, and sodium compounds which in July went down to 123,110 cwt., are back to 251,486 cwt. A large increase is also apparent in the exports of tar oil and creosote. With this one exception, however, all coal tar products show decreases. The following figures give in detail the products which show increases over the July exports, the figures for the latter being given in parentheses : Sulphuric acid, 2,723 cwt. (2,226) ; tartaric acid, 581 cwt. (299) ; ammonia chloride (muriate), 156 tons (121) ; sulphate of ammonia, 7,549 tons (6,510) ; bleaching powder, 8,276 cwt. (4,660) ; tar oil, creosote, &c., 3,275,794 galls. (868,287) ; potassium nitrate (British prepared), 821 cwt. (489) ; sodium carbonate (including soda crystals, soda ash and bicarbonate), 163,450 cwt. (52,408) ; caustic soda, 26,715 cwt. (13,366) ; sodium chromate and bichromate, 3,475 cwt. (2,314) ; sodium compounds (other sorts), 37,735 cwt. (28,243) ; and zinc oxide, 122 tons (50). The following show decreases : Carbolic acid, 4,715 cwt. (5,137) ; naphtha, 1,435 galls. (3,543) ; naphthalene, 970 cwt. (2,784) ; coal tar products not elsewhere specified, 20,317 cwt. (25,809) ; sulphate of copper, 191 tons (558) ; crude glycerine, nil (5,218 cwt.) ; distilled glycerine, 2,088 cwt. (2,862) ; potassium chromate and bichromate, 332 cwt. (990) ; and sodium sulphate (including salt cake), 20,111 cwt. (26,779).

During August 3,103,207 tons of coal, valued at £5,668,594, were exported ; the exports for the preceding months of the year were as follow : July, 816,320 tons ; June, 7,502 tons ; May, 14,066 tons ; April, 606,548 tons ; March, 1,968,078 tons ; February, 1,729,148 tons ; and January, 1,700,106 tons.

Scientific, illuminating, optical, &c., glassware was imported to the extent of 32,956 cwt., valued at £135,436, as against 32,767 cwt. to the value of £130,591 imported in July. Exports under this heading amounted to 1,747 cwt., of the value of £30,794 ; the previous month's total was 1,975 cwt., valued at £35,197.

LAWES CHEMICAL MANURE CO., LTD.—At an extraordinary general meeting held on September 8 the following resolution was carried unanimously : "That each of the 25,193 ordinary shares of £10 each of the company issued and fully paid, and each of the 4,807 unissued ordinary shares of £10 each of the company be divided into ten ordinary shares of £1 each, and that each of the 7,675 seven per cent. preference shares of £10 each of the company, issued and fully paid, and each of the 2,325 unissued seven per cent. preference shares of £10 each of the company be divided into ten preference shares of £1 each." An account of the forty-ninth annual general meeting appears on another page.

Soapworkers' Wages

A Further Reduction in October Proposed

A RESOLUTION instructing their delegates to the National Conference of Soapworkers in London on Wednesday to reject the proposals of further wage reductions was unanimously passed at a meeting of Port Sunlight and Bromborough Pool soapworkers, at Birkenhead, on Sunday night. It was announced that the conference was to be followed by a meeting in London on Thursday of the Joint Industrial Council of the Soap and Candle Trades.

Mr. H. Greatbanks, who presided at the meeting, said the latest proposal of the employers was for a reduction of 2s. per week for all adult male workers to take effect in October, and a further reduction of 2s. per week in December. In addition, the Port Sunlight and Bromborough Pool workers were to be subjected to a reduction of 7s. per week, which would bring them down to the level of soapworkers in London and Leeds. The reductions, contended the speaker, were wholly unjustifiable, and it was necessary for the workers to co-operate and resist the proposals.

Mr. George Beardsworth, the local secretary of the National Union of Distributive and Allied Workers, referred to the reductions which had already taken place in the trade, and compared the position of the soapworkers at Port Sunlight with the employees of the Co-operative Wholesale Society. The latter, he said, were paid higher wages, and worked shorter hours, while the soap was cheaper.

Mrs. Bamber observed that reductions were being made so rapidly that they would be back on the 1914 level before they knew where they were. The speaker condemned the proposed abolition of the wage scale, and remarked that Lever Brothers were making a determined attempt to break up any form of organisation inside the works.

Alderman W. A. Robinson, of Liverpool, spoke of the seriousness of the position, and stated that there was no justification for the attempt to bring the wages of Port Sunlight workers to a minimum of £3 1s. per week. The executive council of the union was prepared to support the workers in any action they cared to take. He knew times were difficult, but he could assure them that the proposed reductions would not be the last.

"If the employers' proposals are accepted," remarked a delegate prior to the conference at the Ministry of Labour on Wednesday, "it will mean that the wage of workers at Port Sunlight and Bromborough will drop another 11s. as their minimum rate is now 72s. The Co-operative Wholesale Society," he added, "who are the largest soap makers not connected with the Lever Trust, are not a party to the present application, and in the event of trouble arising through the present proposals every effort will be made by the workers to keep the Co-operative Society's factories running."

Reports of the stewards in the respective areas were submitted by the delegates, who represented all parts of the United Kingdom. The trade union officials afterwards explained their position, and a line of policy was then discussed in view of Thursday's meeting of the Joint Industrial Council. No official statement was made at the close of Wednesday's conference, which lasted four hours, but it was learned that the position was then delicate and serious. In all, some 50,000 male and female workers throughout the country are affected.

Paisley Technical College

REFERENCE to the necessity of extending Paisley Technical College was made at the distribution of prizes and certificates which took place in the hall of the college on September 7. The chairman (the Rev. J. Porteous) said the governors had had under consideration whether the time had not come when they ought to carry out that extension of the college for which provision was made by the wise and generous foresight of Sir Thomas Glen-Coats when he presented them with the site adjacent to the present buildings. They had come to the conclusion that extension at the earliest time was desirable, not only because of the increase of the number of students, but in order to provide adequate and up-to-date equipment in the matter of laboratories and other requirements. Whether they could go on with this scheme depended altogether on their ability or non-ability to solve the financial problem. In this connexion he mentioned that during the past year they had received a legacy of £5,000 from the late Mr. John M'Lachlan, of the firm of Messrs. Bow & M'Lachlan.

Lawes' Chemical Manure

Board of Agriculture and Nauru Phosphates

SPEAKING on September 8, at the forty-ninth annual general meeting of Lawes' Chemical Manure Co., Ltd., Mr. E. G. Cubitt (the chairman), reviewing the company's prospects for the current year, said the period of drought had not yet ended, and agriculturists would want to see how far this affected the accounts before ordering supplies of fertilisers, and, in addition, the competition from the Continent was still very acute.

He then referred to a circular issued by the Board of Agriculture, advocating the use of ground rock phosphate from Nauru. As all agriculturists are well aware, said Mr. Cubitt, it is grossly misleading to compare the unit value of ground rock phosphate with superphosphate, as the latter has to be sold by law under the guarantee of solubility, whereas ground rock contains only a proportion that is even soluble in a solution of citric acid, and a large proportion of it will take years before it becomes available for plant food. If this class of propaganda had been issued by any private firm the Board of Agriculture would have been the first to raise objections to the issue of statements so grossly misleading.

With regard to the works, the chairman said they had spent during the year a sum far in excess of that spent in previous years.

As they were awaiting a final settlement with the Government with regard to excess profits duty, it was thought advisable to delay the accounts until a settlement had been arrived at. The meeting was, therefore, adjourned until a later date.

Affairs of Nagels & Co.

AN adjourned meeting of creditors under the receiving order made against Nagels & Co., chemical merchants, 51, Fenchurch Street, E.C., was held last week at the London Bankruptcy Court.

The Official Receiver said that the last meeting (*see* THE CHEMICAL AGE, Vol. V., p. 280) was adjourned for want of a quorum. He was still without any information of the debtor, who had not surrendered to the proceedings, except that he was believed to be in Hamburg. He did not know of any assets. Mr. H. B. Mayer, a creditor, said that no one would wish to throw good money after bad, but suggested that steps should be taken to secure the attendance of the debtor, even if they involved the launching of other proceedings.

The creditors decided to leave the case in the hands of the Official Receiver.

Proofs of debt were lodged by: John Elton & Co., Ltd., £72; W. Gibson & Co., £37; H. A. Walker & Co., £217; P. R. McQuie & Son, £149; Simon, Son & Co., Ltd., £101; and H. B. Mayer, £1,200.

Australian Dye Imports

WRITING from Sydney a *Times* correspondent states that arrangements have been completed to form dye committees in Sydney and Melbourne to deal with applications to import foreign dyes. A proclamation was issued on February 27, 1919, prohibiting the importation of dyes other than of British origin unless with the consent in writing of the Minister for Customs. This was the outcome of a request by the Imperial Government (following the Imperial War Conference held in London in 1918) for co-operation in an effort to free the Empire from dependence on German dyes. Under the Peace Treaty a quantity of dyes, not exceeding 50 per cent. of the total stock of each and every dyestuff in Germany, or under German control at the date of the coming into force of the treaty, was acquired for the use of Britain and her Allies. Of that quantity about £40,000 worth came to Australia and was distributed among operators. No other dyes owing more than 5 per cent. of their value to materials or labour of ex-enemy countries have been knowingly admitted to Australia. The Minister for Customs made this statement in the House of Representatives on June 30, and he followed it up by stating that permission would be given to import American dyes in cases where conclusive evidence is submitted that similar dyes of British manufacture are not available. Meetings of the dye committees in Sydney and Melbourne will be held at regular intervals to consider applications.

From Week to Week

THE SLAG PHOSPHATE CO., LTD., of Newport, Mon., are advertising their slag phosphate in provincial daily papers.

SIR ALFRED MOND has been appointed chairman of the newly constituted Cabinet Committee on Unemployment.

The death occurred in Paris on Tuesday of M. ALFRED GRANDIDIER, a member of the Academy of Science, and an honorary D.Sc. of Leeds University.

Owing to its unsaleability due to high retail prices a large quantity of wholesome fish landed during the past fortnight has been sent to MANURE WORKS in Hull.

The total production of CRUDE OIL by the British Burmah Petroleum Co., Ltd., and the Rangoon Oil Co., Ltd., for the month of August amounted to 81,406 barrels.

It is reported that the BARYTES GRINDING MILLS at Hanwood, near Shrewsbury, owned by the Shropshire Mines, Ltd., have been compelled practically to close down owing to German competition.

Trade returns for the port of Swansea for the month of August show a slight falling off of 487 tons in the EXPORT OF PATENT FUEL, and of nearly 6,000 tons in the import of pyrites, sulphur ore, &c.

At a recent meeting of the Gas Committee of Glasgow Corporation it was agreed to ACCEPT THE TENDER of John MacDonald, Ltd., for a roof over the sulphate of ammonia plant at the Proven Chemical Works.

It is reported from Germany that DR. N. E. VAN STONE, the chemical director of the Sherwin Williams Co., of Cleveland, U.S.A., who was tried by the Frankenthal Criminal Court on a charge of commercial espionage, has been released.

On September 8 members of the IRON AND STEEL INSTITUTE, including the president, Mr. Francis Samuelson, Sir Robert Hadfield, and Sir William Ellis, who have been visiting France, inspected the Creusot works where they were received by M. Eugene Schneider.

At the annual meeting of Lawes' Chemical Manure Co., Ltd., held on September 8, Mr. E. G. Cubitt announced the death of Mr. W. B. VAN HAANSBERGEN, a director of the company since 1900. He served the company in the capacity of deputy-chairman for nearly the whole of that period.

A Montreal correspondent of THE CHEMICAL AGE states that on August 30 SIR WILLIAM POPE, K.B.E., F.R.S., was elected to an Honorary Fellowship of the Canadian Institute of Chemistry. The first and only other Honorary Fellow of the Institute is H.R.H. the Prince of Wales.

MR. LEON COOPER, president of Cooper & Cooper, Inc., of New York, and a director of Cooper & Cooper Chemical Co., Ltd., of London, has now arrived in England on the steamer "Olympic," and is making his headquarters at the office of the London company. He expects to be in England for about a month.

In connexion with the report to the effect that there was a number of OXYGEN CYLINDERS lying about on the ex-German submarine Deutschland, the British Oxygen Co., Ltd., point out that these could not have caused the explosion, and that in any case no oxygen was being used in the part of the vessel where the explosion took place.

Among the speakers at the LECTURE CONFERENCE OF WELFARE SUPERVISORS, which is being held at Balliol College, Oxford, from September 15 to 20, are Lord Gorell, Sir Andrew K. Duncan, Dr. E. L. Collis, and Messrs. C. D. Burns, E. Farmer and F. Bramley. The conference has been arranged by the Industrial Welfare Society.

The Registrar of the INSTITUTE OF CHEMISTRY directs attention to an erroneous statement in Part IV. of the Journal of the Institute, to the effect that Dr. P. C. C. Isherwood had been appointed to a lecturership in the University of Cambridge. Dr. Eric K. Rideal is Humphrey Owen Jones Lecturer in Physical Chemistry, and Dr. P. C. C. Isherwood is a director of Messrs. W. J. Bush & Co., Ltd.

On September 7 the members of the Liverpool Architectural Society had the opportunity of inspecting the MERSEY MATCH FACTORY, which is on the point of completion at Garston, for Maguire, Paterson & Palmer, Ltd., a combination of match firms whose operations at Garston promise to recapture the match industry for this country. A site of 38 acres had been obtained on the Liverpool boundary at Speke, and there has been erected what is claimed to be the most up-to-date match factory in the world.

An interesting item in the report on the sea and inland fisheries of Ireland for 1919, issued last week, is that relating to kelp. It is stated that 3,286 TONS OF KELP WERE EXPORTED during the year, of which 1,051 tons came from County Clare. The value of the kelp exported was approximately £20,500. In addition to the kelp exported, it is estimated that about 50 per cent. of the product was manufactured in Ireland into potash for agricultural use in that country.

According to an Agencia Americana cable from Santiago, the NITRATE STOCKS there on September 8 were estimated at 1,380,000 tons. A later advice from the same source intimates that a fresh meeting of nitrate producers will shortly take place for the purpose of definitely fixing the prices of this commodity. Prices are at present very high, and, consequently, there is little demand. The total exports for the first six months of 1921 barely reached 749,000 tons.

The Yorkshire branch of the Industrial League and Council are holding a week-end conference at the Seacroft Hydro, Scarborough, on September 23rd and 24th, the subject under consideration being "The Capitalistic System." Mr. Ernest J. P. Benn, C.B.E., will open the discussion on the capitalistic side, and Mr. Harold Clay, secretary of the Leeds United Vehicle Workers, will answer from the labour point of view. A large attendance of representative employers and trade unionists is expected.

Under the terms of an extension to the working agreement between the Cassel Cyanide Co., Ltd., and the Castner-Kellner Alkali Co., Ltd., Mr. A. T. SMITH, managing director of the Castner-Kellner Alkali Co., Ltd., has been asked to join the board of the Cassel Cyanide Co., Ltd., and Mr. WILLIAM NEILL, managing director of the Cassel Cyanide Co., Ltd., has been asked to join the board of the Castner-Kellner Alkali Co., Ltd. The appointments fall to be formally made by the shareholders in general meeting.

The second annual excursion of the employees of Messrs. ELLIOTT, THOMPSON & BLAIR, wholesale druggists, Corporation Street, Belfast, took place on September 3 to Newcastle and Rostrevor. The party left Belfast at 9.15 a.m. by motor, the first stop being at the Spa, Ballynahinch, where half an hour was spent. Newcastle was reached after a fine run, and after dinner the journey was continued via Annalong to Kilkeel, where a brief stay was made. The party arrived at Rostrevor about 3.30, after some sight-seeing and a visit to Cloughmore Stone. The return journey was made via Newry and Banbridge, and Belfast was reached about 10.0 p.m., everyone being delighted with the day's outing.

The German tanning extract works, the Gerb u. Farbestoff Werke H. Renner & Co., A.-G., at Hamburg, which was reported in THE CHEMICAL AGE to have been acquired by the Forestal Land, Timber & Railways Co., has issued a statement to the effect that the capitulation to foreign interests has come about as the result of the competition of the Argentine tanning extract industry. The motion was put to the extraordinary general meeting of the German company on Monday, when the proposal was unanimously approved. A telegram was read from the Forestal Company, according to which, if the agreement were not accepted, the company would build its own factory in Germany and open competition. Herr Renner said he would no longer accept responsibility if the agreement was rejected. The purchase price is said to be about 73,000,000 marks, or approximately £250,000.

In a paper contributed to the *Zeitschrift für angewandte Chemie*, G. Bruhns discusses the iron rust of a deep red colour which had formed in a boiler fed with peat water. The rust consisted of iron oxide and calcium sulphide; there was no carbonate in the scale. As the feed water itself contained no iron, the rust was due to boiler corrosion, which was very uniform, by the peat water. The feed water was of low hardness and contained only traces of bicarbonate; it was not free from carbon dioxide, and it contained nitric and nitrous acid and organic acids (humin). The author considers the carbonic acid and secondarily the nitric acid responsible for the attack of the iron, and the vapours of nitrous acid, driven off with the steam, responsible for the corrosion of the pipes. Such peat water, he concludes, should be treated with milk of lime, so as to be rendered slightly alkaline.

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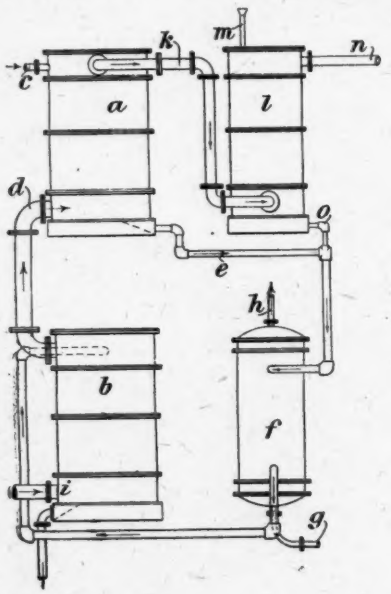
Abstracts of Complete Specifications

167,540. AMMONIUM SULPHIDES, MANUFACTURE OF. South Metropolitan Gas Co., 709, Old Kent Road, London, S.E.15, and P. Parrish, 64, Foyle Road, Blackheath, London, S.E. Application date, April 30, 1920.

When ammoniacal liquor is distilled to obtain sulphuretted hydrogen and ammonia with the object of producing ammonium sulphide it is usually found that these gases are accompanied by so much carbon dioxide that the distillate may contain an excessive amount of ammonium carbonate, and difficulties may arise owing to the crystallisation of the carbonate. The apparatus is for avoiding these difficulties in the treatment of ammoniacal liquor of strength varying between the grades known as 6 oz. and 10 oz. liquor. The crude ammoniacal liquor is introduced through the pipe *c* into the upper section *a* of a column still, where it meets the steam and gases which enter at *d* from the lower section *b*. The liquor then flows through a pipe *e* to a tubular cooler *f*, through which cold water is passed from *g* to *h*. The liquor then passes to the upper part of the lower section *b*, and is treated with fresh steam, which is admitted through the pipe *i* at the bottom. Steam and gas pass from the upper section *a* through the pipe *k* to the bottom of a column still *l*, through which they



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pass upwards against a current of water admitted by the pipe *m*. This water passes through the pipe *o* to join the liquor from the still *a*. Liquor from the lower section *b* passes to the ammonia still. If the still *b* is maintained at a temperature of 98°C. and a pressure of 16 lb. per square inch absolute by regulating the volume and temperature of the steam admitted, it is found that practically the whole of the carbon dioxide is driven off, but the sulphuretted hydrogen remains. When the liquor is subsequently distilled the distillate contains a considerable proportion of ammonium sulphide. When ammonium sulphide or polysulphide liquor is made by passing sulphuretted hydrogen through ammonia liquor the difficulties usually experienced are found to be due to the use of waste sulphuretted hydrogen, which is considerably diluted. These difficulties are avoided by using concentrated sulphuretted hydrogen obtained by treating iron sulphide with sulphuric acid.

167,555. ALUM AND SULPHATE OF ALUMINA, MANUFACTURE OF. A. Matheson, 29, Devonshire Chambers, 146, Bishopsgate, London, E.C. Application date, May 6, 1920.

The process is for treating alunite to obtain alum and sulphate of alumina without the necessity of an independent supply of sulphuric acid. Alunite is heated in a furnace having a series of superposed hearths, the temperature of which increases to 700°–900°C. at the lowest hearth. The alunite passes downwards through the series, and sulphur trioxide, sulphur dioxide and oxygen pass upwards. The two latter combine to form trioxide, with the aid of the iron oxide in the alunite as a catalyst. The gases are passed through alunite which has been previously roasted, together with sufficient water to produce strong sulphuric acid. This operation is effected in a horizontal retort, in which the alunite is placed at atmospheric temperature and is continuously turned over by a screw. The gases are introduced at 400°–500°C. The material is then treated with water to extract the alum and sulphate of alumina, and the alum is then crystallised out. The liquor may be converted into alum by the addition of potassium sulphate. In this process drying and grinding of the ore before roasting is unnecessary, and the process is applicable to low-grade alunite.

167,556. WATER CONTAINING TARRY MATTERS, METHOD OF TREATING AND FILTERING. E. Wade-Wilton and W. Hepworth, Planet Works, Hill Top, Bramley, near Leeds, and C. H. Fuessly, 15, Algernon Street, Monton, Eccles, near Manchester. Application date, May 7, 1920.

The process is for treating water which has been used for washing the gases obtained from wood refuse producer plants, and which contains tarry matter, phenols, &c. The water to be treated passes through a pipe *b* into a tank *a* which contains a conical funnel *d* for receiving the separated tarry matter. A number of tangential baffles 5 are fixed to the sides of the tank, and the water is caused to flow in a circular

Fig. 2.

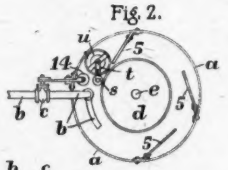
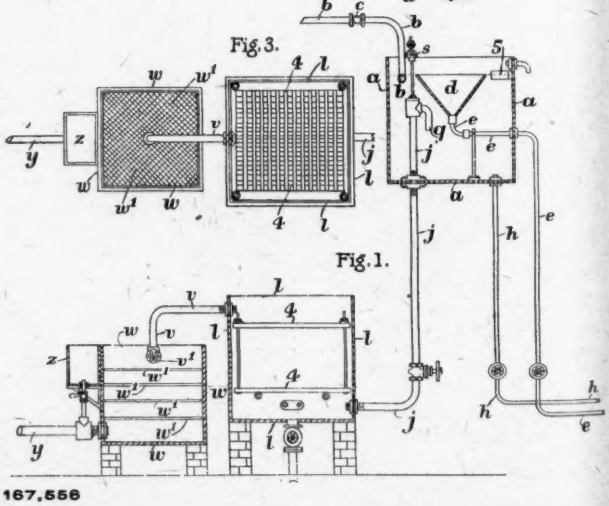


Fig. 3.



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direction by arranging the outlet of the pipe *b* horizontal. The tarry matter is thus separated and directed by the baffles 5 into the funnel *d*, from which it passes by a pipe *e* to a receiver. Any solid matter deposited in the tank *a* is removed by the pipe *h*. The water passes by the pipes *q*, *j* to a filtering tank *l*, containing a frame 4 in which a filtering medium, such as wood wool, is placed. The water then passes through a pipe *v* and spreader *v'* to a tank *w* containing trays *w'* which are filled alternately with sand and charcoal. The mechanical purification of the water is completed in the tank *l*, and any emulsified impurities are removed in the tank *w*. The water may then be further

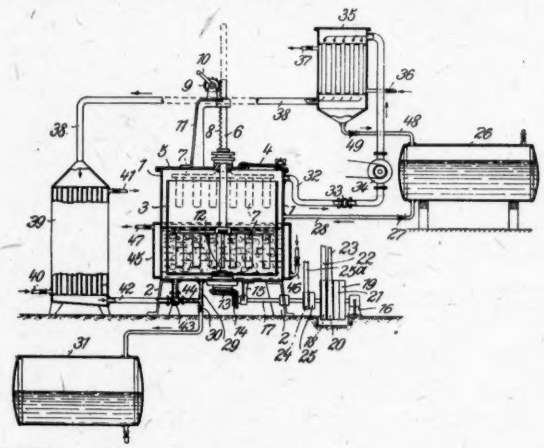
treated as it leaves by the pipe *y* by adding a reagent in proportionate quantities from a tank *z*. An air-vent valve *s* on the pipe *j* is operated by a float *u*, carried by a lever *t*. The valve *c*, which admits the water to be treated, may also be operated by a float 14.

167,582. EFFECTING CONDENSATION REACTIONS. A. V. Blom, 53, Laupenstrasse Bern, Switzerland. Application date, May 11, 1920.

The process is for effecting condensation reactions between organic compounds which take place with the splitting off of halogen hydrogen acids. These reactions require an acid binding agent which in some cases may be an alkali carbonate, an alkaline earth carbonate or a slightly soluble hydroxide. In some cases a sufficiently rapid reaction can only be obtained by the presence of caustic alkali, but the free akali sometimes causes undesirable subsidiary reactions to occur. It is now found that this disadvantage may be obviated by generating the free alkali continuously in the reaction mixture by the use of alkali carbonate and quick lime. In one example, *o*-nitrochlorbenzene is dissolved in methyl alcohol and a mixture of potassium carbonate and slaked lime is added. The mixture is heated continuously on a reflux cooler, and the alcohol finally distilled off, leaving *o*-nitro-anisol, which may be blown off by means of steam. In another example the trea tmentof *p*-nitro-chlorobenzene to obtain *p*-nitro-phenetol is described.

167,667. RECOVERING CAOUTCHOUC AND TEXTILE MATERIAL FROM RUBBER FABRIC, PROCESS OF AND APPARATUS FOR. H. Haddan, London. (From F. Waitz, Obernstrasse 78-80, Bremen, Germany.) Application date, July 9, 1920.

In this apparatus old rubber is treated so that the caoutchouc and the fabric are obtained separately without injury. The rubber is coarsely comminuted and introduced into the container *l*, which contains the perforated drum 3 mounted for rotation on the floor of the container. A stirring device 7 is operated by a rod 6 passing through the cover 5 and engaging with a hand-operated pinion 9. The drum 3 is driven by means of bevel gearing 13, 14 from a power shaft 17. The drum 3 is driven alternately in opposite directions by means of open and crossed belts, 22, 23, which are alternately brought



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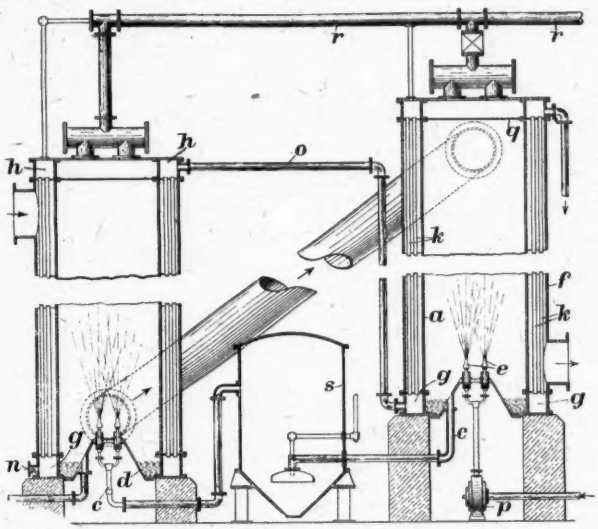
into action. A solvent, such as benzol, toluol, xylol or ether, is then admitted from the tank 26, and the stirring device 7 is raised and the drum rapidly rotated. The material is kneaded by the rotation of the drum, and the caoutchouc is separated and forms a solution. The solution is then passed through the pipe 29 and valve 30 into the tank 31, and the stirrer is raised into the position shown in dotted lines and the drum 3 rapidly rotated by means of the belt 25^a. The stirrer is lowered again and the valve 30 closed, and fresh solvent is admitted and the drum rotated again at the lower speed. The remaining caoutchouc in the fabric is then extracted by rotating the drum 3 at the higher speed, and is run into the tank 31. The valve 43 is then turned, and hot gas is drawn from the heater 39 through the fabric by means of the blower 34, so that the fabric is dried. The gas is passed into the cooler 35 to condense the solvent which flows through pipe 48 to the container 26. The gas returns through the pipe 38 to the heater 39 for use again. The tank 1 is surrounded by a steam jacket 45, and the temperature is maintained at about 115°C.—*i.e.*, about 15°C. below the vulcanising temperature of the caoutchouc. The pressure in the tank 1 may be that obtained by the heating, or it may be artificially increased. Under these conditions the regenerated caoutchouc has an elasticity which is not much inferior to that of the original material.

167,719. RECOVERY OF AMMONIA FROM AMMONIACAL LIQUOR, METHOD AND APPARATUS FOR. W. C. Holmes & Co., Ltd., and M. Boocock, Whitestone Iron Works, Huddersfield, and W. Wyld, West View, The Avenue, Roundhay, Leeds. Application date, January 6, 1921.

The apparatus is of the kind in which the liquor is heated and sprayed into a number of chambers for the recovery of the free and fixed ammonia, the spraying in the second and subsequent chambers being effected by the pressure in the first or previous chamber. Each chamber *a* is surrounded by a heating chamber *f* through which hot gases are circulated. Vertical tubes *k* pass through these heating chambers into headers *g*, *h*. Cold liquor passes by the pipe *n* into the first series of heating pipes and then by the pipe *o* to the second series of heating pipes. The hot liquor then passes through the pump *p* to the centrifugal spraying nozzles *e* which discharge it vertically into the chamber *a*. Free ammonia is



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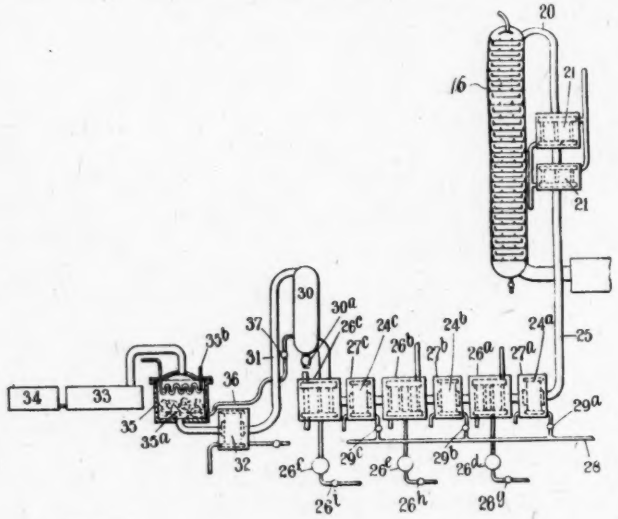
thus driven off and passes through a perforated plate *q*, pipe *b*, and valve *b'* into a main pipe *r* which is connected to the saturator. The residual liquor falls to the bottom *d* of the chamber and passes by the pipe *c* to an intermediate chamber *s* where it is mixed with any reagent for treatment of fixed ammonia salts. The mixed liquid, which is still under pressure, is delivered to the spray nozzles of the second chamber. The fixed ammonia is driven off in this chamber and also passes into the main pipe *r*. When the apparatus is employed for the production of pure ammonia the liquid is subjected to a preliminary treatment in an apparatus of similar form (not shown) to free it from gases such as sulphuretted hydrogen and carbon dioxide. The gases set free pass upwards through a multi-stage absorbing apparatus, which is fed with cold liquor which absorbs the ammonia but allows the waste gases to escape. The subsequent treatment is the same as before.

167,725–6. RECOVERING SULPHUR DIOXIDE FROM FURNACE GASES OR OTHER GASES CONTAINING THE SAME, METHOD OF AND APPARATUS FOR. A. H. Eustis, Milton, Norfolk, Mass., U.S.A. Application dates, May 4, 1920.

167,725. The apparatus is more particularly for protecting from corrosion the pumps used for handling the sulphur dioxide recovered from furnace gases, smelter smoke, or the like. It is found that corrosion is due to the presence of water in the gases and that it does not occur if the gases are dry. The sulphur dioxide extracted in the chamber 16

passes through the pipe 20 to refrigerators or surface coolers 21 which extract part of the water vapour by means of cold brine. The gas then passes to the pump 24*a*, which is provided with a steam jacket 27*a*, which raises the temperature of the pump to such a point that the gas in actual contact with it is raised above the dew point. It is not necessary that the gas not in contact with the pump surfaces should be so heated. Sufficient heat may be subsequently generated in the pump by compression to supply all the heat necessary, or it may even be necessary to reduce the temperature by a water jacket. The compressed gas is passed through a cooler 26*a*, preferably constructed of lead, in which a further quantity



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of water is condensed. The gas is then passed in succession through two sets of similar pumps and coolers 24*b*, 26*b*, 24*c*, 26*c*, and finally through a cooling chamber 30, where most of the remaining water is removed. The compression of the gas in several stages obviates the necessity for cooling the pump, with the risk of local over-cooling and corrosion. The gas then passes through the compression pump 32 to a liquefier 33 and tank 34. A trap 35 is provided which contains liquid sulphur dioxide to act as a desiccator to absorb the last traces of moisture from the gas. This liquefied gas may subsequently be suddenly expanded in the cooler 30 to reduce the temperature.

167,726. This invention consists in the method by which the last traces of moisture are removed from sulphur dioxide by bringing the gas into contact with liquid sulphur dioxide, as described in connexion with the trap 35 and cooler 30 (*see above*).

NOTE.—Abstracts of the following specifications which are now accepted appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention :—143,848 (Soc. Anon. l'Oxhydrique Française), relating to a catalytic process for the hydrogenation of oils and fats, *see* Vol. III., p. 162 ; 145,611 (F. Moeller), relating to the treatment of cellulose, and products manufactured therefrom, *see* Vol. III., p. 293 ; 147,044 (Soc. Générale d'Evaporation Procédés Prache & Bouillon), relating to treatment of residual waters containing fatty and soapy matter, *see* Vol. III., p. 404 ; 149,667 (P. L. Pfannenschmidt), relating to acid chambers, acid mains, and acid towers, *see* Vol. III., p. 543 ; 150,594 (C. Candlot), relating to lime, cement and like kilns, *see* Vol. III., p. 635 ; 157,227 (H. Rupe), relating to camphyl carbinol, *see* Vol. IV., p. 404 ; 157,871 (Chile Exploration Co.), relating to electrodes for electrolysis, *see* Vol. IV., p. 456.

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168,573. Processes and apparatus for the conversion of hydrocarbon oils. Emerson, V. L. May 6, 1920.
168,576. Chlorination of hydrocarbons. Glysyn Corporation. August 31, 1920.
168,582. Apparatus for pulverising coal and other substances. Powdered Fuel Plant Co., Ltd. August 31, 1920.

Specifications Accepted, with Date of Application

136,564. Perylene, Method of obtaining. F. Hansgirg. December 11, 1919.
140,798. Filter presses. Worthington Pump and Machinery Corporation. March 9, 1918.
145,085. Sal-ammoniac skimmings, Process for treating. A. L. Mond. (*Metallbank und Metallurgische Ges.*). June 17, 1920.
147,045. Soapy waters, Process for the decomposition of. Soc. Générale d'Evaporation Procédés Prache & Bouillon. March 3, 1914.
148,388. Old brass, Treatment of, for the purpose of obtaining copper and oxide of zinc. R. E. Bea. August 3, 1917.
148,781. Coke for blast furnaces, Manufacture of. A. Riedel. January 3, 1916.
153,602. Electrical resistance material, Process of manufacturing. Akt.-Ges. Kummler & Matter. November 10, 1919.
154,614. Galilith, celluloid, and the like, Process for producing imitations of. H. Steiner. July 5, 1919.
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168,098. Oxidized ores, Concentration of. L. A. Wood, and Minerals Separation, Ltd. April 20, 1920.
168,108. Purification of organic bodies by distillation. F. W. Berk & Co., Ltd., and J. J. Hood. April 24, 1920.
168,229. Vertical retorts. C. W. Tozer. July 30, 1920.
168,245. Cylindrical kilns. W. J. Mellersh-Jackson. (*Fuller-Lehigh Co.*). April 21, 1920.
168,261. Refractory articles and method of making same. Carborundum Co., Ltd. (*S. C. Linbarger*). September 25, 1920.
168,262. Filtration, percolation and the like, Apparatus for automatic supply of liquid to replace amounts discharged in processes of. W. T. Keeling. October 7, 1920.
168,279. Filtration of blast furnace and like gases. Halberger hütte Ges. December 1, 1920.

Applications for Patents

Agopian, L. A. Process for obtaining vitamines. 23,763. September 6. (France, September 7, 1920.)
Baddiley, J. Manufacture of 1 : 4 naphthol sulphonic acid. 24,139. September 10.
Bainbridge, E. G. Manufacture of 1 : 4 naphthol sulphonic acid. 24,139. September 10.
Baker, Sons & Perkins, Ltd., J. Manufacture of paper for filtering. 23,724. September 6.
Beth, W. F. L. [Firm of]. Filters for purifying air or gases. 23,925. September 8. (Germany, September 30, 1920.)
Beylik, F. G. Process of making pectin-containing material, and resulting product. 3,583. September 5.
Boulton, W. Preparation for prevention of corrosion on metallic surfaces. 23,547. September 5.
British Dyestuffs Corporation, Ltd. Manufacture of 1 : 4 naphthol. sulphonic acid. 24,139. September 10.
Broadbridge, W. Treatment of caliche. 23,759. September 6.
Carpmael, W. (Chemische Fabrik auf actien vorm. E. Schering) Manufacture of active charcoal. 23,983. September 8.
Casale, L. Process for synthetic production of ammonia. 23,741. September 6.
Craig, E. N. Production of oxides of tungsten and molybdenum. 23,964. September 8.
Crawford, T. Clarifying fermented liquors. 23,897. September 7.
Dicker, S. G. S. (Casale and Leprestre). Process for synthetic production of ammonia. 23,741. September 6.
Dow, F. T. Peat products. 23,739. September 6.
Durelco, Ltd. Production of oxides of tungsten and molybdenum 23,964. September 8.
Edser, E. Treatment of caliche. 23,759. September 6.
Farrell, E. Bearings of rollers of dye jigs or vats, etc. 23,820. September 7.
Griffiths Bros. & Co. (London), Ltd. Pigments and preservative compositions for coating, impregnation, etc. 23,860. September 7.
Grove Akt.-Ges., D. Separating apparatus for steam, compressed air and gases. 23,960. September 8.
Harding L. Sulphonation of aromatic hydrocarbons. 23,784. September 7.
Henderson, G. A. Bituminous compounds and processes for making same. 23,732. September 6.
Howland, R. Analysis, synthesis, arrangement and notation of colours. 23,955. September 8.
Leon, J. C. Distilling liquids. 24,060. September 9.
Leprestre, R. Process for synthetic production of ammonia. 23,741. September 6.
Lovasz, N. F. Heating, boiling and evaporation of liquids. 23,862. September 7.
Marsh, J. J. Manufacture of gases from oils, spirits, etc. 23,984. September 8.
Mond, A. (Metallbank und Metallurgische Ges.). Process for continuous leaching of ores, metallurgical products, etc. 24,101 September 10.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

THURSDAY, September 15.

There is an improving tendency in the business during the past week, although orders are still in the main only for small quantities for immediate requirements.

The list of products which will be included in Part I. of the Safeguarding of Industries Act is not yet ready, and, of course, with the uncertainty caused by this further delay in the issuing of the list, little movement is yet being felt, except in one or two directions.

Export may be described as being a shade better, but the competition from the Continent is still very severe.

General Chemicals

ACETONE continues strong and firm.

ACETIC ACID is higher and stocks light.

CITRIC ACID is inclined to be easy, although the price is without change.

ACID FORMIC is firmer, and a fair trade has been transacted.

OXALIC ACID is again higher and stocks are light.

TARTARIC ACID is quietly steady.

BARIUM CHLORIDE is featureless, and the price is inclined to weaken further.

BLEACHING POWDER is in a shade better demand on export account, but business still leaves a very great deal to be desired.

COPPER SULPHATE.—There has been some inquiry for delivery early next year, but makers are not inclined to consider this position at present; the price is without change.

FORMALDEHYDE is very firm, and quite a fair business has been transacted.

IRON SULPHATE is quietly steady.

LEAD ACETATE.—The price is higher, and only small stocks now appear to be available.

LEAD NITRATE is also firmer, with a better demand.

LITHOPONE is only moving off slowly, but the price is well maintained.

POTASSIUM CARBONATE is only in small request, but there are signs of a more steady tendency than has been the case of late, and higher prices have been talked about.

POTASSIUM CAUSTIC continues dull and idle.

POTASSIUM CHLORATE is not quite so active, and the price is without change.

POTASSIUM PERMANGANATE is quietly steady at last quoted figures.

POTASSIUM PRUSSIATE is in good demand, and the price is very firm.

SODIUM ACETATE maintains its advance.

SODIUM BICHROMATE is quietly steady.

SODIUM CAUSTIC.—Many of the re-sale parcels having been absorbed, prices now more closely approximate to those of the makers.

SODIUM HYPOSULPHITE is quietly steady, with a fair business passing.

SODIUM NITRITE is only in small request, and the price is easy.

SODIUM PHOSPHATE is in better demand, but this has so far not been reflected in the price.

SODIUM PRUSSIATE is very firm, with little material available.

SODIUM SULPHIDE is in good request, and price has advanced for the concentrated.

Coal Tar Intermediates

Trade has been somewhat better and prices are all well maintained.

ALPHANAPHTHYLAMINE is in quietly steady request.

ANILINE OIL & SALT are firm at makers' figures.

BETA NAPHTHOL continues idle, with price in buyers' favour.

DIMETHYLANILINE is moving off slowly at last quoted figures.

DIPHENYLAMINE is in short supply, and the price is very firm.

H ACID is very firm, and some business is reported.

PARANITRANILINE is firmer.

RESORCIN is scarce and firm.

SALICYLIC ACID is higher in price, and a still further advance may be expected.

Coal Tar Products

There is little change in our market from last week.

90's BENZOL is still very scarce and the price for prompt delivery remains firm in the region of 3s. in London and 2s. 9d. to 2s. 10d. in the North.

PURE BENZOL is also difficult to obtain, and is quoted from 3s. 4d. to 3s. 6d. on rails.

CREOSOTE OIL is rather more plentiful, and there are several sellers in the market. The price is fairly steady at 8½d. on rails in the North and 9d. on rails in London.

CRESYLIC ACID shows no change, and is quoted at 2s. 3d., f.o.b., for the Pale quality, which price represents about 2s. 1d. on rails, while the Dark is worth about 1s. 10d. to 2s.

SOLVENT NAPHTHA is steady and in fairly good demand at about 2s. 7d. to 2s. 8d. on rails.

HEAVY NAPHTHA is inactive at 2s. 3d. on rails.

NAPHTHALENE is also in poor demand, and is worth about £6 to £10 per ton for the Crude qualities and from £15 to £18 per ton for the Refined.

Sulphate of Ammonia

There are no new features to report.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	2	1	to	0	2	2
Acetone oil	ton	87	10	0	to	90	0	0
Acetone, pure	ton	90	0	0	to	95	0	0
Acid, Acetic, glacial, 99-100%	ton	60	10	0	to	62	10	0
Acetic, 80% pure	ton	42	0	0	to	45	0	0
Arsenic	ton	95	0	0	to	100	0	0
Boric, cryst	ton	65	0	0	to	68	0	0
Carbolic, cryst. 39-40%	lb.	0	0	6½	to	0	0	7
Citric	lb.	0	2	5	to	0	2	6
Formic, 80%	ton	65	0	0	to	67	10	0
Gallic, pure	lb.	0	4	0	to	0	4	3
Hydrofluoric	lb.	0	0	8½	to	0	0	9
Lactic, 50 vol.	ton	35	0	0	to	37	10	0
Lactic, 60 vol.	ton	40	0	0	to	42	10	0
Nitric, 80 Tw.	ton	38	0	0	to	40	0	0
Oxalic	lb.	0	0	8	to	0	0	8½
Phosphoric, 1.5	ton	45	0	0	to	47	0	0
Pyrogallic, cryst	lb.	0	7	6	to	0	7	9
Salicylic, Technical	lb.	0	1	3	to	0	1	4
Salicylic, B.P.	lb	0	1	7	to	0	1	8
Sulphuric, 92-93%	ton	8	0	0	to	8	10	0
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	1	4½	to	0	1	5½
Alum, lump	ton	18	0	0	to	18	10	0
Alum, chrome	ton	37	10	0	to	40	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	12	0	0	to	13	0	0
Aluminium, sulphate, 17-18%	ton	15	0	0	to	16	0	0
Ammonia, anhydrous.	lb.	0	2	0	to	0	2	2
Ammonia, .880	ton	43	0	0	to	45	0	0
Ammonia, .920	ton	30	0	0	to	32	10	0
Ammonia, carbonate	lb.	0	0	4	to		—	
Ammonia, chloride	ton	60	0	0	to	65	0	0
Ammonia, muriate (galvanisers)	ton	45	0	0	to	47	10	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	82	10	0	to	85	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to	0	3	0
Amyl acetate	ton	150	0	0	to	160	0	0

	per	£	s.	d.		£	s	d
Arsenic, white, powdered	ton	32	0	0	to	35	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0
Barium, chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	15	0	0	to	16	0	0
Nitrate	ton	42	10	0	to	45	0	0
Barium Sulphate, blanc fixe, dry	ton	26	0	0	to	28	0	0
Sulphate, blanc fixe, pulp	ton	16	0	0	to	16	10	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	0
Bleaching powder, 35-37%	ton	14	0	0	to		—	
Borax crystals	ton	31	0	0	to	32	0	0
Calcium acetate, Brown	ton	8	0	0	to	9	0	0
,, Grey	ton	10	0	0	to	11	0	0
Calcium Carbide	ton	22	0	0	to	23	0	0
Chloride	ton	12	10	0	to	13	0	0
Carbon bisulphide	ton	60	0	0	to	62	0	0
Casein, technical	ton	85	0	0	to	90	0	0
Cerium oxalate	lb.	0	3	6	to	0	3	9
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	11	0	to	0	11	6
Oxide, black	lb.	0	16	0	to		—	
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	28	10	0	to	29	10	0
Cream Tartar, 98-100%	ton	125	0	0	to	130	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol	ton	92	10	0	to	95	0	0
Formusol (Rongalite)	lb.	0	3	9	to	0	4	0
Glauber salts, commercial	ton	5	5	0	to	5	10	0
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	45	0	0	to	50	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	48	0	0	to	50	0	0
Carbonate (White Lead)	ton	43	0	0	to	46	0	0
Nitrate	ton	48	10	0	to	50	10	0
Litharge	ton	35	10	0	to	36	0	0
Lithopone, 30%	ton	27	0	0	to	29	0	0
Magnesium chloride	ton	12	0	0	to	13	0	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	10	10	0	to	11	10	0
Sulphate (Druggists')	ton	15	10	0	to	17	10	0
Manganese, Borate	ton	70	0	0	to	75	0	0
Sulphate	ton	70	0	0	to	75	0	0
Methyl acetone	ton	85	0	0	to	90	0	0
Alcohol, 1% acetone	ton	105	0	0	to	110	0	0
Nickel sulphate, single salt	ton	65	0	0	to	66	0	0
Nickel ammonium sulphate, double salt	ton	67	0	0	to	68	0	0
Potash, Caustic	ton	29	0	0	to	29	10	0
Potassium bichromate	lb.	0	0	9	to		—	
Carbonate, 90%	ton	31	0	0	to	33	0	0
Chloride	ton	36	0	0	to	38	0	0
Chlorate	lb.	0	0	5	to	0	0	5½
Meta bisulphite, 50-52%	ton	120	0	0	to	125	0	0
Nitrate, refined	ton	45	0	0	to	47	0	0
Permanganate	lb.	0	1	2	to	0	1	4
Prussiate, red	lb.	0	2	0	to	0	2	1
Prussiate, yellow	lb.	0	1	2½	to	0	1	3
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	3	5	0	to		—	
Seconds	cwt.	3	0	0	to		—	
Sodium acetate	ton	28	0	0	to	30	0	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	6½	to	0	0	7
Bisulphite, 60-62%	ton	27	10	0	to	30	0	0
Chlorate	lb.	0	0	4½	to	0	0	5
Caustic, 70%	ton	24	0	0	to	24	10	0
Caustic, 76%	ton	25	10	0	to	26	0	0
Hydrosulphite, powder, 85%	lb.	0	2	3	to	0	2	6
Hyposulphite, commercial	ton	15	0	0	to	16	0	0
Nitrite, 96-98%	ton	40	0	0	to	42	0	0
Phosphate, crystal	ton	23	0	0	to	25	0	0
Perborate	lb.	0	1	6	to	0	1	7
Prussiate	lb.	0	0	8	to	0	0	8½
Sulphide, crystals	ton	17	0	0	to	18	0	0
Sulphide, solid, 60-62%	ton	23	10	0	to	24	10	0
Sulphite, cryst.	ton	15	0	0	to	16	0	0
Strontium carbonate	ton	80	0	0	to	85	0	0
Strontium Nitrate	ton	70	0	0	to	72	10	0
Strontium Sulphate, white	ton	7	10	0	to	8	10	0
Sulphur chloride	ton	41	0	0	to	42	0	0
Sulphur, Flowers	ton	13	0	0	to	14	0	0
Roll	ton	13	0	0	to	14	0	0
Tartar emetic	lb.	0	1	5	to	0	1	6
Tin perchloride, 33%	lb.	0	1	2	to	0	1	4
Tin Perchloride, solid	lb.	0	1	5	to	0	1	7
Protochloride (tin crystals)	lb.	0	1	5	to	0	1	6

	per	£	s.	d.		£	s.	d.
Zinc chloride, 102 Tw.	ton	21	0	0	to	22	10	0
Chloride, solid, 96-98%	ton	50	0	0	to	55	0	0
Oxide, 99%	ton	40	0	0	to	42	0	0
Dust, 90%	ton	47	10	0	to	50	0	0
Sulphate	ton	21	10	0	to	22	10	0

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0	3	3	to	0	3	6
Alphanaphthol, refined	lb.	0	3	9	to	0	4	0
Alphanaphthylamine	lb.	0	2	6	to	0	2	8
Aniline oil, drums extra	lb.	0	1	5	to	0	1	6
Aniline salts	lb.	0	1	6	to	0	1	7
Anthracene, 40-50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	4	3	to	0	4	6
Benzidine, base	lb.	0	6	0	to	0	6	6
Benzidine, sulphate	lb.	0	6	6	to	0	7	0
Benzoic acid	lb.	0	2	0	to	0	2	3
Benzoate of soda	lb.	0	2	0	to	0	2	3
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	6	9	to	0	7	0
Betanaphthol	lb.	0	2	3	to	0	2	6
Betanaphthylamine, technical	lb.	0	9	0	to	0	9	6
Croceine Acid, 100% basis	lb	0	4	6	to	0	5	0
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	6	9	to	0	7	6
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	6	to	0	1	8
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	2	9	to	0	3	0
Dimethylaniline	lb.	0	3	9	to	0	4	0
Diphenylamine	lb.	0	4	6	to	0	4	9
H-Acid	lb.	0	8	0	to	0	8	6
Metaphenylenediamine	lb.	0	5	6	to	0	5	9
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	6	6	to	0	7	0
Monosulphonic Acid (2:7)	lb.	0	7	0	to	0	7	6
Naphthionic acid, crude	lb.	0	4	0	to	0	4	3
Naphthionate of Soda	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid	lb.	0	4	9	to	0	5	0
Nitronaphthalene	lb.	0	1	4	to	0	1	5
Nitrotoluol	lb.	0	1	3	to	0	1	4
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	2
Orthotoluidine	lb.	0	2	3	to	0	2	6
Orthonitrotoluol	lb.	0	0	10	to	0	1	0
Para-amidophenol, base	lb.	0	12	0	to	0	12	6
Para-amidophenol, hydrochlor	lb	0	12	6	to	0	13	0
Paradichlorbenzol	lb.	0	0	7	to	0	0	8
Paranitraniline	lb.	0	4	6	to	0	4	9
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	9	to	0	6	0
Paraphenylenediamine, distilled	lb.	0	12	0	to	0	13	0
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic anhydride	lb.	0	3	9	to	0	4	0
Resorcin, technical	lb.	0	5	0	to	0	5	6
Resorcin, pure	lb.	0	7	6	to	0	8	0
Salol	lb.	0	2	6	to	0	2	9
Sulphanilic acid, crude	lb.	0	1	4	to	0	1	6
Tolidine, base	lb.	0	6	6	to	0	7	0
Tolidine, mixture	lb.	0	2	6	to	0	2	9

Potash Prices

With the revision of prices for the coming season the trade in potash fertilisers has shown more activity. The following quotations are being made for French supplies :—

	F.O.R. London.
French Kainit, 14 per cent.	... £3 7 6 to £3 10 in bags
Sylvinite, 20 per cent.	... ... 4 7 6 in bags
Sylvinite, 30 per cent.	... ... 6 11 6 ,,
Muriate of potash, 50 per cent.	... 12 6 0 ,,
Sulphate of potash, 90 per cent.	... 16 0 0 ,,

Considerable improvement has been noted in the buying of muriate of potash and kainit 14 per cent. by merchants who stand in need of supplies for the autumn-sown crops and the top dressing of grass land.

Exports of COTTONSEED OIL from the United States in May amounted to 18,947,796 lb., as compared with 11,655,272 lb. in May, 1920, an increase of 62 per cent. The total cottonseed oil shipments during the eleven-month period ended May, 1921, were 269,105,939 lb., as compared with 148,127,351 lb. for the same period in 1920. The consumption of cottonseed oil during May, 1921, was 307,000 bbls., the largest for any month this season.

Company News

UTAH COPPER CO.—A quarterly dividend, of 50 cents., payable on September 30, is announced.

MORGAN CRUCIBLE CO.—The share transfer books are closed from September 16 to September 30 for the preparation of dividend warrants.

ANGLO-CHILIAN NITRATE & RAILWAY CO.—The share transfer books will be closed from Sept. 19 to Oct. 3, both days inclusive, for the subdivision of shares.

CANADIAN DYES LTD., of Trenton, Ont., a recently formed company, proposes to place on the market in the near future supplies of acid black 10B, acid Y and direct blue 2B.

BRITISH ALUMINIUM CO.—A dividend at the rate of 5 per cent. per annum, less tax, has been declared on the ordinary shares for the six months to June 30 last, payable on October 1.

LEVER BROTHERS, LTD.—The transfer books of the Company's registered 7 per cent. first mortgage debenture stock will be closed from Sept. 17 to Sept. 30, both dates inclusive.

FORSTERS' GLASS CO.—The transfer books of the 7½ per cent. cumulative participating preference shares are closed from September 17 to 30, for preparation of dividend warrants, payable September 30.

ASSOCIATED PORTLAND CEMENT MANUFACTURERS.—The register and transfer books of the preference shares are closed from to-day (Saturday) until September 30 for the preparation of dividend warrants.

RECKITT & SONS.—The interim dividend to be paid on October 1 is 2½ per cent., less tax, for the quarter ending September 30, and not at the rate of 5 per cent. per annum for the half year, as previously stated.

EMERALD RUBBER AND COCONUT.—The profit for the year to January 31 last was £16,849 and £5,842 was brought in, making £22,691. Debenture interest, sinking fund and expenses of the new issue of shares absorbed £1,026, leaving £21,665. Depreciation absorbed £3,000, and income tax reserve £3,000, leaving £15,665 to be carried forward.

HARRISONS & CROSFIELD.—The directors have declared a dividend on the cumulative preference shares at the rate of 6 per cent. per annum for the three months to Sept. 30. Warrants will be posted on Sept. 30 to holders registered on the books of the company at that date, including approved transferees whose transfers have been lodged not later than Sept. 15. Income tax will be deducted at the rate of 6s. in the £.

BRUNNER, MOND & CO.—A Stock Exchange announcement states that dealings in 27,668 ordinary shares of £1 each, fully paid, have been specially allowed by the committee under Rule 148A. These securities will rank pari passu with those in which special settling days have already been appointed as soon as they are identical and the certificates are ready for distribution, and with those for which an official quotation has already been granted as soon as they are identical and are officially quoted.

DE BRUYN, LTD.—The directors of De Bruyn, Ltd., manufacturers of margarine, nut butters, &c., have issued a circular to their shareholders in which they say that in view of the serious losses suffered by the Company during the war owing to enemy action and the heavy trading losses of the last twelve months, they see no prospect of being able to recommend the payment of the preference dividend for some years. Continuing, the circular states: Having regard to their interest in your company through the Niger Co., Ltd., Lever Brothers, Ltd., of Port Sunlight, have offered to acquire from the preference shareholders in your company the whole of their preference shares in exchange for 20 per cent. cumulative preferred ordinary shares of 5s. each of Lever Brothers, Ltd., on the basis of one Lever share for one De Bruyn share. The Lever shares are quoted on the London Stock Exchange. They will carry dividend as from July 1, 1921, and will thus afford a source of immediate income. Lever Brothers' offer is conditional on all the De Bruyn preference shareholders accepting the same not later than October 12 next. Your directors unhesitatingly recommend the offer for acceptance in the best interests of the preference shareholders, and already a number of the largest preference shareholders in your company have expressed their intention to accept the offer.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. NO.
Belgrade ...	Soap. Particulars from Enquiry Room, Dept. of Overseas Trade, 35, Old Queen Street, S.W. 1.	—
Shanghai ...	Chemists' sundries; paints ...	230
San Francisco.	Industrial Chemicals; oils; greases; waxes.	232
San Francisco.	Barytes; paris white; zinc oxide; lithopone; ochre; umber; sienna; red oxides of iron; venetian red; creosote oil; all earth pigments or raw materials used by dyers, paint manufacturers, paper and rubber mills, and varnish manufacturers.	237
New York ...	Lithopone red seal light resisting; zinc oxides; prussiate of soda; cresylic acid; cream of tartar; sodium sulphide; gum arabic; beeswax; magnesium chloride; blanc fix; cyanide of soda; English sal ammoniac; bromides; naphthaline (refined); Fuller's earth.	240
Chile	Drugs, &c.	—

Chemical Merchants' Affairs

Robert Berk & Co.

ROBERT BERK, trading as Robert Berk & Co., chemical merchant, 10, City Road, E.C., and late of 47, Mark Lane, and Audrey House, Ely Place, E.C., who was adjudged bankrupt on July 5 last (*See* THE CHEMICAL AGE, Vol. V., p. 68), attended at the London Bankruptcy Court on Tuesday for public examination on a statement of affairs showing unsecured liabilities £460 and assets £10, apart from book debts of £354, treated as bad.

In answer to Mr. W. P. Bowyer, Senior Official Receiver, the debtor said that for some years before 1914 he was employed by his father, a London chemical merchant. In April of that year he began business as a chemical merchant at 26, Long Acre under the style of Robert Burke. He gave up the business in January, 1915, and was afterwards employed by a firm of general merchants until September, 1916, when he recommenced business as a chemical merchant at Audrey House, Ely Place, under the style of Robert Berk & Co. Under an arrangement with a company whose offices he used the company became entitled to 50 per cent. of his profits and liable for 50 per cent. of his losses. He continued to trade until February, 1917, when he was called up for the army. He was demobilised in May, 1919, and since then he had been employed by firms of chemical merchants. His present position was due to the fact that he was called up for the army and had suddenly to discontinue his business and to losses by bad debts.

The examination was concluded.

Patents Court Cases

APPLICATION has been made under Section 24 of the Patents and Designs Acts, 1907 and 1919, for the following patent to be endorsed "Licence of Right": 117,823 (F. W. Howorth—Norsk Hydro-Elektrisk Kvaelstofaktieselskab), relating to the treatment of ammonium nitrate. Any notice of opposition must be given by October 14, 1921.

United States exports of LINSEED OIL during June totalled 37,406 gallons. The imports for the same period amounted to 488,868 gallons.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Partnership Dissolved

WHITTAKER, RICHARD, AND WHITTAKER, BIRLEY, as gum and starch merchants, at Midland Street, Ardwick, Manchester, under the style or firm of R. Whittaker, by mutual consent as from September 5, 1921. Debts received nad paid by Richard Whittaker.

Liquidator's Notice

AMMONIA SODA COMPANY, LTD. (In voluntary liquidation.) General meeting of company at 7, Norfolk Street, Manchester, on Tuesday, October 11, 1921, at 12.30 p.m., to receive liquidator's report of winding up.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of* 1908, *provides that every Mortgage or Charge, as described therein, created after July* 1, 1908, *shall be registered within* 21 *days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July* 1, 1908, *require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

MIDLAND COUNTIES GLUE CO., LTD., Northampton.—Reg. September 6, mortgage securing an amount not exceeding £10,000 for which the mortgagees may become liable under a certain guarantee; charged on glue factory and other buildings at Dallington St. James, Northampton. *Nil. December 31, 1920.

GILBERT & KNOWLES, LTD., London, E.C.—Reg. September 1, £2,000 debentures (filed under sec. 93 (3) of the Companies' (Consolidation) Act, 1908), present issue £1,000; general charge. *Nil. October 14, 1920.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

EDWARDS, J. M., 311, Fulham Palace Road, S.W., chemist. £15 5s. 4d. July 13.

NOBLES DRUG STORES, LTD., 2, Well Street, Cable Street, E., chemists. £14 10s. July 12; £21 11s. July 22; £11 6s. July 22.

WOOLDRIDGE, LAWRENCE CYRIL, 4, Bramshill Road, Harlesden, chemist. £18 11s. 5d. July 14.

JAMACO MANUFACTURING CO., 43, Lower Church Road, Weston-super-Mare, soap manufacturers. £19 17s. 8d. July 27.

ALLKINS, H. HUDSON, 1, Exchange Buildings, Coulsdon, chemist. £10 3s. 8d. July 21.

HICKS, AVEY FREDERICK MONEY, 235, Queens Road, Wimbledon, manufacturer, chemist. £21 1s. 10d. July 19.

LEYLAND & BIRMINGHAM RUBBER CO., LTD.—The report to June 30 last states that the balance brought in was £57,636. From this has to be deducted loss for year, after providing for depreciation, discount, and bad and doubtful debts, less estimated amount outstanding to be recovered on account of overpaid excess profits duty, £20,014—£37,622; less preference dividends to June 30, 1921, £3,000, leaving a disposable balance of £34,622. Owing to the abnormal conditions prevailing throughout the whole of the trading period and in view of the present financial position, the directors do not recommend any dividend on the ordinary shares, but that the whole of the disposable balance be carried forward. Meeting at Leyland, September 21, at 12.30.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 *and* 117, *Chancery Lane, London, W.C.*2 :—

WAVERLEY OILS, LTD., manufacturers and dealers in all kinds of oils and greases. Nominal capital, £1,000 in 900 non-cumulative preference shares of £1 each and 1,000 deferred ordinary shares of 2s. each. Subscribers: E. Stewart, "Amhurst," Carshalton Grove, Sutton, Surrey; A. B. Lumley, 4, Chester Place, Regent's Park, N.W.1.

NICE FLORE EXPORT, LTD., 13, Vincent Square, Westminster, S.W., manufacturers of perfumes, perfume powders, &c. Nominal capital, £100 in 100 shares of £1 each. Directors: L. Chenantais, 130, Rue de la Pompe, Paris, France; G. Varounis, 118, Avenue du Champs Elysees, Paris, France.

VIADUCT ALUM CO., LTD., The Marsh, Widnes, Lancashire, alum manufacturers. Nominal capital, £6,000 in 6,000 shares of £1 each. Subscribers: F. Farrington, 18, Arpley Street, Warrington; J. Farrington, 18, Arpley Street, Warrington.

JAMAICA SALT CO., LTD., 23, Austin Friars, E.C.2, manufacturers of and dealers in salt. Nominal capital, £5,000 in 4,000 preference shares of £1 each and 10,000 ordinary shares of 2s. each. Subscribers: F. W. D. Higgins, 3, Iddesleigh House, Caxton Street, S.W.1; H. E. A. Digby, 23, Austin Friars, E.C.2.

ROMANEASCA ANGLO-ORIENTAL PETROLEUM CO., LTD.—To acquire lands, mines, minerals, natural gas, oil shale, petroleum, or other substances, and turn same to account. Nominal capital, £25,000 in 25,000 shares of £1 each. Subscribers: T. Stuart Overy, 42, New Broad Street, E.C.2; A. E. Gliddon, 65, Belgrave Road, Walthamstow, E.17.

GERALD BROMAGE & CO., LTD., 9/10, Foster Lane, Cheapside, E.C., general dealers in essential oils and perfumery. Nominal capital, £5,000 in 5,000 shares of £1 each.

PORTHAM SEPARATORS, LTD.—To acquire information as to any invention in relation to the use and application of steam separators. Nominal capital, £5,000 in 20,000 shares of 5s. each. Subscribers: W. L. Waite, 28, Wallingford Avenue, North Kensington, W.; A. H. Hawthorn, 4C, Sutton's Dwellings, Bethnal Green, E.

GARTH & BROWN, LTD., 6, Paton Road, Piccadilly, Manchester, dry-salters. Nominal capital, £1,000 in 1,000 shares of £1 each. Directors: A. Garth, 97, Humphrey Street, Old Trafford, Manchester; L. Brown, Ash Villa, Grosvenor Square, Ashton-on-Mersey.

Benn Brothers' Social Circle

ON Saturday last some sixty members of Benn Brothers' Social Circle were entertained at Orpington Priory, the residence of Mr. C. E. Hughes, one of the directors of Benn Brothers, Ltd., proprietors of THE CHEMICAL AGE. After tea the interest was divided between a programme of games and an examination of the Priory itself, which is of considerable antiquarian interest. There is a record that the Hall of the building was used in 1270 for an ecclesiastical court presided over by Hugh de Mortimer, the first Rector of Orpington. The oldest parts of the fabric, therefore, probably date from the middle of the thirteenth century. Additions to the place were made about 1390, and a century later a certain Prior Selling, of Christchurch, Canterbury, made great improvements in the Prior's rooms. About 1630 the Honourable Richard Spencer, a prominent Royalist, occupied the house and made further additions, which included a wing of half-timber construction to the right of the entrance. The greatest interest was evinced in the masonry, fine old timbers, doorways, windows, ceilings and other decorative features of the building. The weather was favourable, and the party were also afforded the opportunity of wandering round the beautiful old gardens and meadows which surround the house, and these were seen at their best in the brilliant sunshine. On leaving a vote of thanks was accorded to Mr. and Mrs. Hughes for their hospitality, and the care and forethought which had evidently been taken to make the visit a pleasurable one.

New Tees-side Chemical Works

ON September 9 the Chairman and directors of the Synthetic Ammonia and Nitrates, Ltd., visited Billingham, on the north bank of the Tees, where the Company are erecting new works on an area of about 850 acres of land, with a river frontage of about 1,650 ft., for the manufacture and production of ammonia, nitrates and various by-products. The erection of dwelling houses on a large scale is also in progress for the accommodation of the workmen and their families. Recreation fields will eventually be laid out for the use of the employees, and on the completion of the works, employment will be afforded for several thousands of workmen. At the conclusion of the visit Mr. Roscoe Brunner, chairman of the company, on behalf of his colleagues and himself, thanked the Tees Commissioners for their kind reception and expressed great satisfaction at what they had been shown that day, and hoped that when the company's new works were completed and put into operation they would not only prove profitable to the company, but also of great benefit to the whole of the surrounding district.

Nauru Island Phosphates

THE Ministry of Agriculture have issued a leaflet (No. 379) recommending farmers to try the mixture of the Nauru and Ocean Islands phosphate and slag for application to grassland, especially on heavy and peaty soils. The control of the phosphates of these islands has been vested in Commissioners, who have arranged with a company to take the whole of the output allotted by the Commissioners to the United Kingdom. This company has arranged to distribute it, mixed with basic slag in such a manner as to supply the farmer with grades of finely-ground material containing a minimum of 40 per cent. to a maximum of 65 per cent. of phosphates. The mixture costs from 2s. 6d. to 3s. per unit of phosphate of lime delivered to the farmer's nearest station, whereas basic slag (30/32 per cent. total phosphate) costs 4s. 3d. or (20/22 per cent. total phosphate) 4s., and super-phosphate (30 per cent. total phos phate) 4s. per unit.

Compensation Claim Allowed

A FIFTEEN-YEAR old youth, John Annet, brought an action at Barry County Court on August 6 against the Aberthaw & Rhoose Portland Cement Co., Ltd., in respect of an injury sustained while in the company's employment on July 28, 1920.

Plaintiff, who was on crutches, stated that when engaged in cleaning parts of the steam digger he stepped on to the rim of the disc cover, which lay on the ground, and the iron flew up and struck him in the left groin. He was attended by a doctor, and was subsequently removed to hospital at Cardiff, where he was under treatment for three months. Dr. Andrew Neilson said he saw the plaintiff on August 2, and owing to the swelling increasing he incised the wound, doing so again on the 9th. This having no effect he incised it a third time, when a large quantity of pus came away. In consequence of the injury plaintiff would never have the full use of the leg again.

The defence sought to prove that plaintiff's condition was due to tubercular disease of the hip.

His honour Judge Hill Kelly gave judgment in favour of plaintiff, granting him compensation in respect of total incapacity from July 30, 1920, when he was obliged to leave work.

South African Trade Commissioner's Tour

MR. W. G. WICKHAM, H.M. Senior Trade Commissioner in South Africa, is engaged on an official tour of this country for the purpose of discussing with firms the possibilities and conditions of United Kingdom trade with the Union of South Africa. The first part of his tour includes the following towns: Leicester, on September 19-21; Nottingham, on September 22-23; Sheffield, on September 28-30; Leeds, on October 3-5; and Bradford, on October 6-11. Firms in these centres desiring to interview Mr. Wickham should communicate immediately with the Secretary of their local Chamber of Commerce. Arrangements to visit other industrial centres will be made and notified in due course.

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TRADE GUIDE

CHEMICAL AGE

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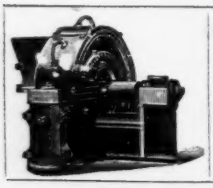

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THE Trade Guide is a compact and handy form of reference to a representative list of firms engaged in various branches of the Industry. In most cases fuller particulars may be found by referring to the displayed advertisement elsewhere.

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